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BULLETIN of the ATOMIC SCIENTISTS . . .

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Editorial: International Cooperation of Scientists . . .

Slowly, international cooperation in science, disrupted by the war, is being resumed. Conferences are being held, partly on the initiative of old-established international organizations, and partly under the sponsorship of newly created United Nations bodies such as the UNESCO.

Every scientist is whole-heartedly in favor of full cooperation with his fellow-scientists abroad. For a long time after the age of Enlightenment, when the international scientific community was first established, this community continued to function even in times of war. Governments warred on each other, but Academies remained at peace. But the growth of nationalism together with the development of modern technology has gradually transformed the limited wars of dynasties into total wars of entire nations. Now, after two world wars, the development of scientific methods of warfare has chained science tighter than ever to the national state. As a consequence, high walls of secrecy are being erected, not only between former enemies, but even between recent allies.

Every international scientfic conference is a welcome event. Not only do these reunions bring together old friends who remember the brotherhood of science of before 1933—perhaps even before 1914. What is more important, they bring the tradition of science as a unifying force in humanity, to the conscience of a new, war-grown generation of scientists. Only by a return to the old universal tradition can science escape becoming a handmaiden of national technology—war technology above all. Such an utilitarian nationalistic degeneration would not only deprive science of its moral value as a disinterested search for truth, but would deter great minds from entering it and thus write an end to the age of scientific discovery.

II

However much we may welcome the restoration of professional cooperation between nations, it is not enough. The atomic bomb, germ warfare, the world-circling stratosphere rockets, will not wait for gradual restoration of international trust and cooperation. Unless a new departure in international relationship is made soon, all the well-meant attempts to resume international scientific life will come to naught. The apprehension of a catastrophic development has caused large groups of American scientists to forget their past aloofness in politics and to organize for a fight to prevent science from becoming an executioner of mankind. Within a year, this fight has brought two successes: The passage of a domestic law of atomic energy, conceived in the spirit of peace, and the official adoption by the United States of a program of international control and cooperative development of atomic energy. The American scientists are overwhelmingly behind this program, not because as loyal citizens they support the policy of their government, but because they are convinced that international control offers the only alternative to an armaments race and an atomic war.

III

American scientists may, by themselves, achieve further useful results in the enlightenment of the American people. They may influence US international policy in the field of atomic energy, by stressing the primary importance of this subject in world affairs, and by supporting a patient, sustained effort to bring about understanding among nations.

But what is most needed now, is a broadening and internationalization of the fight for a rational solution of atomic energy problems. We need an international organization of scientists dedicated to this fight.

It must be formed in a truly scientific spirit of search for objective truth, and devoted to service to humanity, transcending national, party or class affiliations; and it can only achieve its purpose if it brings together the most representative scientists of the world.

During the past year, when plans for international control were discussed among American scientists, many anticipated that these plans might appear in a different light to Americans and to sincere friends of America abroad. This was to be expected particularly in the proposed step-by-step procedure of disarmament and release of information. It was felt that, in such case, the initiative for formulating alternative proposals might best be left to representatives of other nations. Some of these divergent views are now coming to light. We believe that a reasonable program for their solution can be worked out in a frank discussion between qualified representatives of world scientists. The realization of this program must be the common goal.

We need international organizations of scientists to attain various worthy objectives: the advancement of scientific knowledge; furthering the welfare of scientific workers; study of social problems of world-wide importance and for dissemination of information on scientific developments of major importance to mankind. But above all this, we need an international community of scientists to develop a positive program of international control of atomic and other weapons of mass destruction, and to lead national groups in a concerted effort for the realization of the program.

E. R.

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The Bikini Tests and Public Opinion . . .

. . . William L. Laurence

The following is an article from the New York Times by its distinguished science reporter.

The tumult and the shouting about the Bikini atomic bomb explosions have died down and the time has come for serious thinking about the net results and their implications, national and international.

To evaluate the two tests in Bikini Lagoon it is not enough to determine the effects of the atomic bomb on naval vessels of various types artificially placed at varying distances from the center of the explosion.

Scientists and others closely connected with the development of the bomb, who know its potentialities for wholesale destruction and who devoted their energies during the last year to arouse public awareness of the danger confronting civilization, consider it of vastly greater importance to gauge the effect of the Bikini tests on the change of attitude of the public toward the greatest problem facing mankind today.

Considered from this point of view, the Bikini tests add up to a tragedy of errors for which the world may pay a heavy price unless measures are taken in time to counteract them.

On returning from Bikini, one is amazed to find the profound change in the public attitude toward the problem of the atomic bomb.

Before Bikini the world stood in awe of this new cosmic force which, concentrated in one rather small package, could destroy a large city, kill and maim hundreds of thousands and bring the surrender of an army of 5,000,000 men without the firing of a shot.

Facts Given to Truman

Since Bikini this feeling of awe has largely evaporated and has been supplanted by a sense of relief unrelated to the grim reality of the situation. Having lived with a nightmare for nearly a year, the average citizen is now only too glad to grasp at the flimsiest means that would enable him to regain his peace of mind.

He had expected one bomb to sink the entire Bikini fleet, kill all the animals aboard, make a hole in the bottom of the ocean and create tidal waves that would be felt for thousands of miles. He had even been told that every one participating in the test would die.

Since none of these happened, he is only too eager to conclude that the atomic bomb is, after all, just another weapon. As such it is a problem concerning only the military and nothing for the average citizen to be worried about. Or so the average citizen feels.

How far from reality is such an attitude is revealed by the two reports submitted to President Truman by his two evaluation boards. Nevertheless, it is doubtful that these reports will be sufficient to undo the damage. This factor in itself may far outweigh whatever gains may have been derived from the Bikini tests.

If there is anything the world needs much more than further Bikini tests, it is a reawakening of its consciousness to the fact that the atomic bomb is not just another weapon against which our military minds will find a defense, but the greatest cataclysmic force ever released on earth. Unless some means are found for its control, it will inevitably lead to the destruction of civilization.

Despite the unanimous warnings of the leading scientists who developed the bomb and know its potentialities, this appalling fact had not yet been fully impressed on the minds and hearts of the peoples of the world when the Bikini tests were made. Nor judging by their remarks, had this been fully grasped by the representatives of some of the world's leading nations.

The Bikini tests diverted, at least temporarily, the world's attention from the greatest danger that had ever faced it.

What the reports by the President's evaluation boards did not emphasize is that future wars will employ not atomic bombs singly but by hundreds and thousands.

Dr. J. Robert Oppenheimer, under whose direction the bomb was developed at Los Alamos, N. M., has testified that in the not too distant future atomic bombs will be easy to make and will cost no more than $1,000,000 each. There is enough uranium and thorium in the earth's crust to manufacture them by the thousands, once adequate plants have been built.

While the secret of their manufacture is possessed largely by us, it will take only a relatively short time, five to ten years, before other nations will have it.

The Bikini tests have yielded another lesson of utmost significance to our strategists that is not touched on in the reports to the President. Watching the cloud of death that spread over the Bikini fleet, this observer considered it obvious that amphibious invasions such as that in North Africa, Italy and Normandy would become impossible against an enemy possessing atomic bombs.

A few atomic bombs exploded in the air and under water would not only sink all the invasion craft but also kill every man aboard them. Those who by miracle might escape the blast and heat would surely die by the invisible, all-penetrating radiation.

Had the Germans possessed an atomic bomb, they would not have had to wait until the invasion got under way. They could have destroyed all England before the invasion could be organized.

Another vital fact must be impressed on the public mind and on some of the world's statesmen who still seem to think and talk in terms of pre-atomic diplomacy. The atomic bomb is not primarily a tactical weapon against navies or task forces spread out over several miles of ocean but the ideal terror weapon, to be used strategically for the wholesale destruction of cities, industries and populations.

In the case of an atomic war against the United States, an enemy could well afford to ignore the existence of our Navy at sea. Professor Oppenheimer has testified that a rain of atomic bombs could wipe out 40,000,000 of our population in one night.

Such an attack would destroy most of our vital industrial centers and the industries where the sinews of war are produced, including the shells for the Navy's guns, torpedoes, electrical equipment and all the thousands of items of paraphernalia without which a modern navy could not exist. It would also destroy the harbors to which all ships must eventually return, the naval bases and the naval supply depots.

Deprived of these, ships at sea would be left completely helpless after their supplies of ammunition, food and fuel had been exhausted.

Enemy Gleans Data

Furthermore, the Bikini tests, while they have given us some lessons considered valuable, have furnished valuable lessons to a potential enemy. We have revealed to him, at great expense to ourselves, that one atomic bomb exploded in the air "does great harm to superstructures of major ships within a half-mile radius" and that "no ship within a mile could have escaped without some damage to itself and serious injury to a large number of its crew."

We have further revealed to him that unprotected personnel within one mile of an air-burst atomic bomb would suffer high

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How To Keep The Peace . . .

An Analysis and a Proposal . . . . . A. P. Lerner

INTRODUCTION: A STATEMENT OF THE PROBLEM

No person who is interested in the future of human liberty can at the present moment avoid taking a definite stand concerning the threat of a third world war.

In this memorandum we have tried to show how a maximum of security against war (short of surrender to any aggressor) can be obtained with a minimum of change in social organization.

This is not because there are no things we would like to change. It is because to require more than is absolutely necessary to assure peace is harmful because it lessens the chance of the really indispensable requirements being accepted. On the other hand, to require less than is necessary diminishes the chance of peace by giving a false sense of security.

We have tried to clarify the main issues as well as to propose the solution which would meet the least resistance. We would consider better than ours any solution of the problem which would meet with less resistance without losing effectiveness, or which would be more effective without encountering more resistance. But all the proposals we have so far seen are either not sufficiently effective or demand things which, however desirable otherwise, are not indispensable for international peace. We know well enough how discouraging will be the resistances to any effective peace plan. But since to our best understanding there is no easier way out, it follows that if anything can be done at all, it will have to be on the lines of our minimized requirements.

TWO POSSIBLE SOLUTIONS

Another world war could be avoided with certainty only if all the powers would be willing to forego military action in all circumstances. There are two instruments which would increase the likelihood of the powers undertaking to forego military action and keeping their word. One is a **General Disarmament Agreement** with adequate inspection. The other is a system of **Collective Security**, i.e. an organization of the powers in defense against potential aggression by any one of them, commanding such an overwhelming array of military strength that the potential aggressor, seeing the chances of success negligible, is deterred.

Both instruments have their limitations. A disarmament agreement alone may be broken by any nation and then once more war can be avoided only by surrender to the aggressor, involving the acceptance of imposed ideologies, intolerable restrictions of liberties, or wholesale exploitation.

A system of collective security, on the other hand, could be misused and could also break down. Instead of serving to insure a just peace, it might be used oppressively, namely for purposes other than the prevention of aggression. At the same time, defections or disagreements might put an end to its overwhelming power. The collective security organization could also lose its effectiveness if the military strength of the nations loyal to it were to decline in relation to that of an agressor. It must remain both **strong** and **just** if it is to succeed. Collective security prevents war only to the extent that it deters aggressors. If its deterrent effect is insufficient, we are left with an armaments race and eventually war.

For this reason every effort should be made to induce the government of the United States to propose a **disarmament agreement** in the first place and to promote it by every means short of war or surrender.

SOURCES OF RESISTANCE TO DISARMAMENT

Proposals for effective disarmament (with inspection) face three kinds of resistance. These stem from **Tradition, Fear** and **Ambition.**

Tradition: Nations are traditionally reluctant to give up any part of their sovereignty for any reason whatever. Recognition of the threat of an atomic war may help overcome this tradition. It could be further weakened by convincing the individual nations that their independence and freedom would not be threatened, either by individual nations or by international bodies, if they gave up their sovereign rights to the extent necessary for effective disamament.

Fear: Nations are reluctant to weaken their military power out of fear of impairing their relative military position, thus depriving themselves of the possibility of resisting outside pressure and laying themselves open to foreign domination. It is necessary to convince them that general disarmament need not lead to shifts of relative national power, and that the security obtained through it is greater than the protection offered by an arms race.

Ambition: Some governments may pursue a policy of aggrandizement, aiming to conquer part or all of the world for ideological, power, exploitational or other reasons. They may choose war if war is the only way to carry out their policy of aggrandizement.

How can we deal with these sources of resistance to effective disarmament?

The only thing we can do against the tradition of unlimited sovereignty and ambitions for aggrandizement is to influence our own people and our own government not to allow these obstacles to stand in the way of disarmament. Lack of freedom of communication prevents us from exercising the same influence on people in some other countries. Yet if a sincere disarmament proposal is made by us, this may itself have a great effect on other nations.

The principle obstacle we have to overcome is fear—especially each power's fear of giving up armament prematurely, thus becoming a prey to the ambition of other powers. Our first objective must be the fourth of the four freedoms of the Atlantic Charter—**freedom from fear.** The tradition of sovereignty, and even ambition, may to a great extent be interpreted in terms of fear. One of the results of universal fear is the belief that a war for world hegemony is imminent. This is now leading Britain, America and Russia to expand their spheres of influence by every means available, so as to secure a more favorable initial position in the expected war.

A **General Disarmament Agreement** as such would counteract fear and lessen the danger of war breaking out because of fear.

THE NECESSARY FEATURES OF EFFECTIVE DISARMAMENT

The fear of premature relative disarmament can be overcome by proceeding by stages, such that at each stage there is a gain in security corresponding to the armaments sacrificed **without a serious change in the relative power position at any time.** The stages worked out for atomic

energy control in the Lilienthal report form a useful pattern for this kind of procedure.

Insofar as the atomic bomb is concerned, the principles and methods set forth in the Lilienthal report are admirable. But disarmament cannot be wholly effective if limited to only one or a few selected kinds of armament. Such a partial disarmament is likely to affect **relative** power and to increase the fear of those who think themselves relatively weakened. The disarmament agreement must be comprehensive including all weapons not needed for domestic purposes.

The disarmament agreement must cover not only technical disarmament in war weapons but also political disarmament, involving a relaxation of systems of alliances, of spheres of influence, and of such restrictions of freedom within these spheres as are imposed to insure the subservience of the occupied countries. This includes the withdrawal of occupation forces. Such withdrawals, apart from benefitting the occupied countries, would contribute to the removal of causes of conflict. Like other disarmament measures, they should not be directed at changing the relative military position of the powers in terms of potential conflict.

Disarmament should therefore begin with the atomic bomb and should then proceed rapidly, eliminating in two or three years the production of all weapons not needed for domestic use, as well as standing armies, military training and all other economic, psychological and educational war preparations.

THE ROLE OF INSPECTION

An indispensable feature of any satisfactory disarmament agreement is effective inspection to give all nations adequate assurance that no secret armament is being undertaken. The Disarmament Agreement must therefore immediately set up a **Disarmament Inspection Commission.** The Commission is not a decision-making body, hence no voting need take place and the veto question does not arise. The only task of the Commission is to check on compliance with disarmament agreements and to publish its findings. It is not concerned with sanctions. If any power breaks the agreement, the arms race and a possible war may start unless checked by a collective security organization. The Commission exists only to make sure that no power, by secretly breaking the disarmament agreement, can gain a great advantage over an unarmed world.

The Commission should have offices in every country with all the privileges attached to diplomatic agencies. It should have an adequate staff of competent inspectors recruited from all nations, especially from the small neutrals (Sweden, Switzerland, etc.) and nominated by a qualified majority of the nations. The inspectors must have free access and facilities for checking everywhere. Denial of access would constitute a clear violation of the Agreement. The reports, regular and extraordinary, of all inspectors should be published **automatically.** To substantiate the factual correctness of the reports, rechecks and reinspections should be undertaken whenever inspectors report suspicious circumstances or whenever a report issued by an inspector is contradicted.

Furthermore, the inspectors and those who may help inform them should be granted a maximum of independence. The inspectors should be able to protect their informants, and enable them to emigrate.

In general the disarmament should be dissociated from all other domestic and international issues. Its sole objective is to eliminate the danger of war by a mutual renunciation of the means of waging war. Repugnant as any social system may appear to outsiders, attempts to change it by war must be renounced and belligerent as any country's ideology, material preparations and policies may be, military action should be taken only in the case of "clear and present danger." This does not mean that an aggressor must always be given the advantage of choosing the time and place for the first overt attack—but merely that, short of virtual surrender, forcible action should be postponed with careful regard for the possibilities of favorable changes in the suspected nation's government or policy.

COLLECTIVE SECURITY—A CHECK TO POTENTIAL AGGRESSORS

As long as agreement on these lines is observed by all, war is avoided. Such a scheme however may break down. It is necessary therefore to provide for ways to prevent war in case the disarmament agreement breaks down. This implies a collective security agreement.

Under the collective security agreement all nations will pledge themselves to proceed jointly against any of their number who is guilty of violating the Disarmament Agreement or of an act of aggression. Under its present statutes, the United Nations organization cannot put such an agreement into effect because any member possessing the veto can stop action against itself or against any other nation it may wish to support. Collective security however means that **collective** military action will be taken against any aggressor.

Simultaneously with proposing the Disarmament Agreement, the United States Government should therefore invite all nations to join such a collective security organization, or to change the United Nations statutes so that they can effectively provide collective security.

If the Disarmament Agreement rapidly and effectively abolishes all warlike preparations, there will be no necessity for the collective security organization to act in any way. But if some country violates the Disarmament Agreement, war can be prevented only by surrender or by a collective security organization with sufficient power behind it to make it effective as a deterrent.

If any significant power should refuse to participate in the Disarmament Agreement, there could of course be no disarmament agreement and peace would depend right from the beginning only on the collective security organization. A collective security organization can be established even if it is not universal as long as the signatory powers are strong enough to deter potential aggressors.

If we should fail to mobilize the practical universality which is necessary for the disarmament agreement or even the overwhelming majority of power which is necessary for collective security, humanity will face a life and death struggle in which civilization may well be utterly destroyed.

The very frightfulness of this outlook may become a favorable factor in inducing all nations to agree to disarmament. If this old decision to disarm is not taken now, we will live in terror and insecurity and will have to devote ourselves to constant war preparations. But in an atmosphere free of terror, institutions for the peaceful settlement of international problems will grow. The more successful we are in building up such institutions, which constitute the essence of an effective legal world order, the less danger there will be of backsliding into an armaments race.

One bold decision now can avert the doom facing humanity.

Two International Scientific Meetings in England

. . . . . *Henry A. Boorse*

I

On July 29-31, an international conference of Atomic Scientists was held at Oxford, England. It was called by the (British) Atomic Scientists Association, an organization the formation of which was described in the **Bulletin** (v. 2, nos. 3 and 4). In contrast to the British Federation of Scientific Workers—with which it cooperates closely—this Association is not a mass organization of a trade union type, but consists of a limited group of highly qualified scientists who have worked on British-Canadian, or American atomic bomb projects and whose interest is centered on the problem of control of atomic energy.

The international physical conference, sponsored by the Physical Society of London and the Cavendish Laboratory at Cambridge University held July 22-27th at Cambridge offered an exceptional opportunity to gather together leading scientists from all over the world to discuss the crucial problems posed by the release of nuclear energy. Owing to the crowded program of this meeting, the Atomic Scientists Association invited those guests of the Conference interested in this problem to come to Oxford for a three-day meeting immediately following the Cambridge Conference. A large and representative group accepted and participated in the following program:

Monday, July 29

National Legislation

International Control

Discussion open by Prof. H. L. Anderson (Chicago) and Prof. M. L. Oliphant (Birmingham)

Tuesday, July 30—10 a.m.-1 p.m.

Applications of Atomic Power

Discussion opened by Lord Cherwell

Tuesday, July 30—3 p.m.-6 p.m.

Possibility of an International Federation of Atomic Scientists and the Aims and Functions of such a Federation.

Discussion opened by Professor N. F. Mott

Wednesday, July 31—3:15 p.m.-6 p.m.

Closing Session and Reception. Speakers:

Prof. N. F. Mott (Great Britain) Introductory Remarks

Prof. R. Peierls (Great Britain) Report on the Conference

Prof. J. M. Burgers (Holland) and Prof. Kowarski (France) Aspects of the Atomic Energy Problem

Prof. Boorse (U.S.A.) The Federation of American Scientists

Capt. Blackburn, M.P. (Great Britain) Control of Atomic Energy in England

Mr. Lindsay, M.P. (Great Britain) British Atomic Energy Problems

All sessions except the final one were closed to the public and to members of the press. This proved to be a wise precaution since it allowed the utmost freedom of discussion of all subjects except classified information.

LEGISLATIVE SITUATION IN U.S. AND BRITAIN

In the Monday meeting, the history of American legislation (the May-Johnson and the McMahon Bill) and the role of scientists in it was described by Prof. H. L. Anderson. Prof. Peierls presented an analysis of the British Atomic Energy Law. He pointed out that this law has only been passed in the first reading and is still subject to change. It makes no provision for an Atomic Energy Commission and in fact no such commission could have power according to British law, such power residing only in various ministers—in this case in the Minister of Supply. The scientists however, are anxious to have express provision for an advisory board of experts so that the government will be properly advised. The terms of the present bill provide for the government's monopoly of activity in this field, including the possession of raw materials and the supervision of mining. Various activities may however, be carried on under licensing agreements. The government realizes that science in the Universities must be left free and that there must be some scope for industrial activity. As regards secrecy, nothing in the official Secrets Act is to be changed. Any great discovery bearing on the possible security of the nation is to be put at the disposal of the government and not published for the use of "irresponsible" persons. This is quite a new restriction on science and it is difficult to see what the effect of this provision will be.

ATOMIC ENERGY DEVELOPMENT IN EUROPEAN COUNTRIES

Professor Scherrer stated that in **Switzerland** an Atomic Energy Commission has been appointed which acts as an advisory committee to the President. No legislation has been passed as yet, and in regard to secrecy, the Head of the Commission decides what shall and what shall not be published. The Commission already has at its disposal funds which are being used in support of science in the Universities. He mentioned that there were small groups in Swiss engineering firms who were very much interested in atomic energy and were working on the design of a machine to use atomic power.

Professor Perrin reported that an Atomic Energy Commission had been created in **France** about nine months ago. This commission consists of the Prime Minister, a general Administrator, an officer from the military services, and four scientists. The commission has a monopoly on the raw materials, uranium and thorium. There is also an advisory board for administering the government's monopoly on fissionable materials and isotopically-separated materials. Secrecy provisions apply only for those scientists who are working directly in the government service under the control of the Commission; they are not permitted to publish without authorization. There are no secrecy restrictions on publications of scientists working in the French universities.

Professor Clay gave a resume of the present position in **Holland.** He stated that a Committee for Atomic Energy Research had been formed about six months ago for the purpose of investigating applications of nuclear physics. The government has made funds available for the use of this committee up to the amount asked (no figures were given) but emphasized that there was no restriction on research and no stipulations in regard to secrecy as this was against the "free spirit of science." Only those working directly in the military services on applications of nuclear research were so bound. My impression of Clay's attitude, coupled with numerous private talks with other Dutch nations, made me feel that this group perhaps more than any other really wanted a free exchange of information.

Professor Waller next spoke about the situation in **Sweden.** No legislation has yet been drafted by the government but an Atomic Energy Commission was formed the Universities. Although this work is to about six months ago and funds have been granted by the government for work in be carried on without prohibition on publications nevertheless the military establishment is also at work on nuclear research, and publication there will be decided by a staff in the Military Research Institute.

INTERNATIONAL CONTROL

These reports concluded the program on National Legislation and following an in-

Prof. Boorse acted as a representative of the American Federation of Scientists and as an observer for the Carnegie Endowment for International Peace at the meetings described in this article. The report is based, in part, on notes prepared by Prof. R. Peierls and Dr. P. Doty. We are indebted to Prof. James T. Shotwell for permission to use portions of Prof. Boorse's report to the Carnegie Endowment for International Peace.

termission the session went on to consider International Control. Professor Oliphant opened the discussion with a most frank and forceful account of the United Nations Atomic Energy Commission proceedings. He offered an interpretation of the Russian misgivings concerning the Baruch proposals. He felt one should not lose hope that the gap between the two proposals before the A. E. Commission could yet be bridged. He regretted that the British delegation had not attempted to formulate an alternative proposal that might have been more acceptable.

Dr. Kowarski, scientific advisor to the French delegation in the UN Atomic Energy commission, felt that Russian objections to the Baruch plan were more fundamental than mere misgivings and that a compromise on the basis of this plan is therefore a more formidable task than implied by Prof. Oliphant.

APPLICATIONS OF ATOMIC POWER

The Tuesday morning session was opened by Lord Cherwell with an address on the "Applications of Atomic Power". He criticized the exaggerated claims which have been put forward in the British press regarding the benefits to be expected from atomic power. An analysis of the coal production from which most British power is obtained reveals the following: less than 3.5% of the working population is engaged in mining coal and less than 1/20th of the national effort is used in producing power. Of this latter figure, 85% is expended in power distribution. Making due allowance for improvement in distribution, it appears that the total effort that could be saved is 1¼% of the national effort.*

There are special applications where the use of atomic power may present great advantages, such as in warship propulsion, but for national power no advantages can be seen immediately. America may get atomic power soon, but it won't be economic.

The present state of public feeling about atomic power has another harmful side because it has the effect of retarding the effort to mechanize the coal mines and to build dams where suitable for water power.

Lord Cherwell concluded his remarks with the suggestion that a general self-denying ordinance that no large power piles be built for ten or fifteen years would involve no actual hardship. Further, the problem of inspection and control would be greatly simplified.

The discussion of Lord Cherwell's speech was summarized by Prof. Peierls as follows: "The meeting attempted to strike the balance between two extremes, on one hand absurd statements about an Atomic Age in which we would have plenty of power effectively for nothing, and on the other hand the lack of vision that usually meets novel proposals. We all are aware that we are only at the beginning of a development of which nobody can see the end. The importance of Atomic Power rests more in its novel features, in the fact that the weight of the consumed fuel is negligible, rather than in the amount obtainable. As far as we know now atomic power is tied to very special raw materials, which are relatively rare or difficult to extract; economic factors in their utilization are not fully explored and we do not know for example whether it is reasonable to count on enough ever to supply anything like the whole power needs of the world, let alone open up power on a new vast scale. But new discoveries will show new ways, and no scientists would dare predict what will be the position in 20 years from today. For this reason most of us would like to see the power projects pushed vigorously since only in that way can the necessary experience for further developments become available."

INTERNATIONAL ORGANIZATION OF ATOMIC SCIENTISTS

The afternoon session was devoted to a discussion of the possibilities of forming an international federation of atomic scientists and on the aims and functions of such an organization.

Professor Mott opened the discussion by suggesting that an international organization was cumbersome and that national organizations are undoubtedly more effective. However, liaison between these organizations is necessary in order to secure the best results. He hoped that liaison with the Russian scientists would be achieved and that the closest cooperation with the American group would be maintained. One of the functions of the international organization should be to provide for the periodic meeting of the officers of national atomic associations. An international office would also serve for the rapid exchange of vital information as well as for publications and periodicals.

Dr. Burgers expressed the hope that an international body could be formed which would emphasize that nuclear studies should be undertaken only for peaceful ends.

After some discussion it was decided that the main function of the international body at this time would be to facilitate the rapid and accurate exchange of information.

On motion, it was decided to select a representative from each country who would cooperate in finding the proper organization for carrying out the aims of the international bureau. The following persons were designated:

Professor Boorse—New York
Professor Perrin—Paris
Professor Hylleras—Norway
Professor Bhabha—India
Professor Clay—Amsterdam
Professor Waller—Sweden
Professor Stueckelberg—Switzerland
Professor Pryce—Britain

Prof. Pryce is to act as the temporary Secretary of the international organization. Prof. Pryce has addressed a letter to representative organizations of scientists in Argentina, Australia, Belgium, Brazil, Canada, China, Czechoslovakia, Denmark, Jugoslavia, New Zealand, Poland, Union of South Africa and the USSR inviting them to designate representatives from their countries.

A second motion was made, namely, to explore the location for a suitable international office. Professor Boorse was asked to explore the possibility of setting up the offices of the International Information Bureau under the auspices of the Federation of American Scientists, preferably in New York.

Another suggestion was to contact Dr. Joseph Needham, Director of the Division of Natural Scientists in UNESCO to obtain help from that organization.

II

"Associations of Scientific Workers" are trade-union type organizations of academic and industrial scientists, teachers and related professional workers, which have had a considerable success in the countries of the British Commonwealth in the last two decades. In Britain, in particular, the British Association of Scientific Workers has 16,000 members, including many of the most prominent scientists, and has close relations with the Labor party. The British group was responsible for an important step toward bringing together, after the recent war, the scientists of various countries. It sponsored, in March 1946, the conference on "Science and Welfare of Mankind," which was attended by Dr. J. A. Simpson for the Federation of American Scientists and was reported in the Bulletin, v. I, No. 8. The speeches by A. V. Hill, P. M. S. Blackett, and F. Joliot, delivered at this conference, were reprinted in the Bulletin, v. I, Nos. 7, 8, and 10. At this conference it was decided to call an international meeting of Associations of Scientific Workers in July, to consider the organization of a Federation. This meeting was held on July 20 and 21, in London. The following brief report was prepared by Prof. H. A. Boorse, who together with Dr. P. Doty, was present as observer for the Federation of American Scientists.

* Compare with the more detailed calculations in Prof. Marschak's article in this issue of the Bulletin. Lord Cherwell's address appears in the August 24th issue of "Nature".

A World Federation of Scientific Workers . .

The organization of a world-wide federation of national Associations of Scientific Workers, concerned with the responsibility of science in promoting human welfare was achieved at the Inauguration Meeting held in London on July 20 and 21, 1946. Delegates and observers from seventeen nations attended the meeting which had been arranged by the British Association of Scientific Workers. These were:

Australia
Dr. E. H. S. Burhop, Mr. G. Batchelor

France
Mr. Bonet-Maury, Mr. Mathieu

South Africa
Miss P. M. Cooke

Canada
Mr. N. Veall, Prof. D. Cass-Beggs

Poland
Prof. Joseph Obrebski

U. S.
Dr. Paul Doty (N.Y.), Mr. H. R. Hay (Phila.), Prof. H. A. Boorse (N.Y.), Dr. Walter S. Adams (Engineers and Architects Assn., Pasadena), Prof. I. Fankuchen (Brooklyn)

Belgium
Dr. Max G. E. Cosyns

China
Mr. Chow, Mr. Tsao

Spain
Dr. Duperrier

Great Britain
Prof. P. M. S. Blackett, Dr. W. A. Wooster, Prof. J. D. Bernal, Dr. R. C. Murray, Mr. E. J. Widdowson (Institute of Professional Civil Servants), Mr. V. Stott (same)

India
Dr. B. C. Guha, Prof. N. M. Saha, Mr. G. D. Bhavnami, Mr. P. K. Sanyal

Holland
Prof. L. Rosenfeld, Dr. P. van de Leeden, Dr. R. Schmidt, Dr. J. M. Burgers

Czechoslovakia
Dr. J. Beran, Dr. Brdicka, Dr. Richter

UNESCO
Dr. Joseph Needham, Dr. Yeh Chu-Pei

After a discussion, the delegates drafted a constitution. An Executive Council was elected to carry out the administrative work until the first Assembly of delegates from member organizations can be held. The offer of the Natural Sciences Division of UNESCO to grant the Federation office space at its new headquarters in Paris together with secretarial help and probably a major part of the salary of the Secretary General and expenses of attendance at Council meetings was accepted.

Professor Blackett (England), as President of the British Association, gave the opening address in which he reviewed the organization of science throughout the world and described how such an organization as contemplated by the Federation might fit into this scheme. Dr. Wooster (England) told the history of the discussions which culminated in this meeting. A delegate from each group or nation then summarized the work of his organization and in most cases expressed the desire that it could be extended and coordinated at an international level. The remainder of the first day and most of the second day was devoted to a point-by-point discussion and revision of the proposed constitution.

The following provisional Executive Council was elected:

President: Prof. F. Joliot (France)

Vice-Presidents: Prof. J. D. Bernal (Great Britain), Prof. N. N. Semenov* (USSR)

Secretaries: M. P. Bonet-Maury (France), Dr. R. C. Murray (Great Britain)

Treasurer: Dr. Harlow Shapley* (USA)

Ordinary Members:
Dr. W. A. Wooster (Great Britain)
Dr. T'sien* (China)

Regional Representatives:
Czechoslovakia & Poland:
Prof. M. A. Belehradek*
British Commonwealth:
Mr. N. Veall
Western Europe:
Prof. L. Rosenfeld
Far East:
Dr. T'U Chang-Wang*
India:
Prof. M. N. Saha
USA & South America:
Dr. P. M. Doty

(*) indicates that consent of this individual has to be obtained.

Two further regional representatives remain to be elected, to represent the Soviet Union and Scandinavia.

It was further agreed that each organization at the conference should elect a corresponding member to receive all information from the Executive Council.

The Executive Council met on July 24 with Professor Joliot in the chair. After general discussion, it was agreed that one committee headed by Dr. Murray would prepare a booklet, for printing and general circulation, containing an introduction by Prof. Joliot, copies of the speeches delivered at the meeting by Prof. Blackett and Dr. Wooster, a summary of the meeting, summary of the constitution and list of officers. Another committee composed of Wooster (Britain), Veall (Canada) and Doty (USA) was instructed to bring the constitution into final form and to write a preamble. When the constitution is approved by the Executive Council it will be circulated to all organizations represented at the meeting for ratification.

In the provisional Constitution it is declared that the aim of the Federation shall be to promote action in the following directions:

a. To work for the fullest utilization of science in promoting peace and the welfare of mankind; to insure that science is used to help solve the urgent problems of the time.

b. To promote international cooperation in science and technology, particularly through close cooperation with UNESCO.

c. To encourage the international exchange of scientific workers and of scientific knowledge.

d. To preserve and encourage the freedom and coordination of scientific work.

e. To encourage improvements in the teaching of the sciences and to spread the knowledge of science and its social implications among the peoples of all countries.

f. To achieve a closer integration between the natural and social sciences.

g. To encourage improvements in the professional, social, and economic status of scientific workers.

h. To encourage scientific workers to take a more active part in public affairs, and to make them more conscious of and more responsive to, the progressive forces within society.

Among the suggestions for future work were the following:

a. Mutual assistance to strengthen existing organizations and to initiate new ones where not yet set up.

b. Formulation of policy on the control and utilization of atomic energy, world food shortage, and the recovery of science in war-devastated countries.

c. Consideration of a code of rights and duties for scientists.

d. Efforts to improve training facilities for science students and technicians and the teaching of science in schools.

e. Investigation of secrecy and the commercial utilization of science.

f. Closer integration of the individual sciences.

g. Science propaganda by films, books and broadcasts.

The Economic Aspects of Atomic Power . . .

. . . . . J. Marschak

The following was delivered by Professor Marschak before The Second Rocky Mountain Conference on Atomic Energy June 24, 25, 26 at Estes Park, Colorado, sponsored by the Social Science Foundation of the University of Denver. It will appear as a chapter in the forthcoming publication "Power Without War," a review of the proceedings of the conference, which will soon be available at The Social Science Foundation, University of Denver. "Atomic Energy Friend or Foe," a digest of the proceedings of The First Rocky Mountain Conference on Atomic Energy, may now be obtained from the Foundation.

It is important to acquire a correct sense of proportion as to the economic effect of any reduction in the cost of heat and electricity that may be achieved through the use of nuclear fission. Immediately after Hiroshima hopes of the general public soared high: many believed that soon all our work would be done by atomic robots. A few weeks later notes of sobriety were sounded. Some of the best known scientists testified before the McMahon committee that the immediate economic benefits of the new invention may be easily outweighed by its military dangers; so much so that it might be best "to throw into the Mississippi" the fissionable materials already produced. More recently a different and less negative attitude was taken by the Lilienthal committee.

It has "concluded that the beneficial possibilities—some of them are more than possibilities for they are within close reach of actuality—in the use of atomic energy should be and can be made to aid in the development of a reasonably successful system of security." The committee's plan "is in part predicated on that idea." An international Atomic Development Authority should combine policy functions with the creative study and development and even—to an extent—the managerial control of peaceful applications of atomic energy. This would attract high grade personnel and give the international body superior knowledge, vigor, and prestige. Far from being a play with fire, the development of peaceful uses might even prevent the fire. Whether this is so depends on the actual size of the promise held out by the new source of energy.

PROSPECTS—IMMEDIATE AND REMOTE

Of the various forms in which nuclear processes can be used economically, the production of cheap electricity is probably the earliest available; though in the long run it may be easily overshadowed by other applications. Specifically, the direct use of low temperature heat for heating densely populated towns may also soon prove economically feasible; the direct use of high temperature heat of the pile (for example, for melting metals) will, no doubt, be explored and may or may not prove feasible. Probably the most important but the least immediate of all applications are those which will be due to the new knowledge of matter, both dead and living, which scientists hope to acquire by using radioactive tracers, a cheap by-product of the pile. For example: if, helped by these research tools, we learn to imitate the action of green leaves in absorbing the sun's energy, the making and splitting of plutonium may become as obsolete and wasteful a process as the burning of coal.

But this is very remote. For the time being, it is in order to compare the cost of electricity based on fission with the cost of electricity based on the burning of coal (or oil or gas) or derived from the energy of falling water. The essential advantage of the fission process is the very low cost of transportation of atomic fuel (plutonium or light uranium, probably in combination with thorium), per unit of energy produced. The most obvious consumers of fission-based electricity are therefore industries and localities remote from either coal (or oil or gas) or falling water. This includes long voyage ships but excludes (because of the weight of protective shields) light overland vehicles such as automobiles, thus leaving a large part of oil consumption safe from competition.

FUEL FREIGHT AND NATIONAL INCOME

How important is the national effort spent on fuel transportation compared with the total national effort? It is not very important, and therefore the possible economy due to atomic power seems, at the first glance, small indeed. The average wholesale price of coal in the United States was, until recently, about $5 per ton. Roughly, one half of this price was the cost of mining, another half the cost of transportation and handling. And since one pound (1/2000 of ton) of coal makes about one kilowatthour of electricity, we say that each coal-based kilowatthour contains about 250/2000=⅛ cent's worth of fuel transportation. This is a small fraction of the wholesale price of electricity which may amount to as much as ¾ cents or more. The economy due to the saving of fuel transportation cost is even smaller if compared with the retail prices of electricity paid by the small consumer —say, 4 cents per kilowatthour; or compared, for that matter, with the price of aluminum wares into which electricity enters as an important cost component but which also contains other costs: transportation of raw materials, of semi-final and final products, their handling in wholesale or retail trade, and, of course, the production process itself. All this simply amounts to saying that the transporting of coal to power plants is a small part of electricity's cost; that electricity forms only a small part of the total national product; and that therefore the dropping of coal transportation alone cannot make us very much richer than we are or give us much more leisure than we have already. This can also be seen by taking global figures. We produce each year 600 million tons of coal, worth, say, 3 billion dollars. If one-half of this sum, spent on handling and transporting coal, could be saved, and then efforts of railroad men and coal merchants directed into other pursuits, our national income say, 150 billion, would increase by 1%; or if, instead, we decided (and succeeded) to spread the idleness evenly over all people, we could start our weekends 24 minutes earlier (1% of a 40 hour week). Even this effect of atomic power might seem exaggerated because fissionable materials may not be able to compete with coal in all its uses. In fact, power plants burn only about ⅛ of the total coal supply of the U.S. Railroads consume about 1/5 of American coal and are not easy to electrify over long stretches; the steel industry needs coal as a chemical agent as well as fuel; in residential heating coal (as well as oil) retains its advantage in less densely populated communities. To be sure, such limitations can be removed by inventions, say in the shield construction for locomotives or in ore reduction. But, for the immediate future, the direct increase of national income or leisure would be based on the savings in the transportation of fuel for power purposes alone. This would, then mean only one eighth of one per cent of national income or national effort.

PRODUCTION COSTS

It has been argued that the economy in fuel transportation may be offset by the high cost of production of atomic fuel. Even its use for power production would in that case, be uneconomical, at least on the territory of the U.S. Since the fission of one pound of plutonium produces roughly 2½million times more heat than the burning of one pound of coal, it has been contended that, to be competitive, plutonium would have to cost less than 2½ million times the price of coal or, say, less than $7000 a pound. This is certainly a small fraction of the actual per-pound cost of the materials that were contained in the three atomic bombs exploded in 1945. However, this calculation ignores entirely the important by-product of fission of plutonium (or of light uranium) when it is imbedded in natural uranium: viz., plutonium itself. According to the Lilienthal report, the primary or "unsafe" plants would produce plutonium and (for physical reasons) exactly one-half of the world's supply of nuclear energy. The other half of energy would be produced in "safe" plants; in these no plutonium is made. Such plants would, of course, be less economical. As an intermediate case one can visualize a plant whose fission by-products contain plutonium but which has to ship them away to an "unsafe" plant for purification. Thus half or more of world's nuclear energy would be produced under the following conditions:

input: 1 pound of plutonium + x pounds of natural uranium + labor and materials used in operation and purification + amortization and interest;

output: energy + x pounds of plutonium.

The number x is not published; and little experience (published or not published) can yet exist regarding the cost of purification. The history of chemical engineering makes it almost certain that this cost will soon be brought substantially below the pioneer Hanford level. If it becomes sufficiently small and if x is sufficiently larger than unity, then plutonium can be said to be, in the economic sense, self-replenishing, similar to an installation kept in repair. Only interest and obsolescence—a fraction every year—have to be charged on such an installation in the price of the energy produced. Furthermore, the initial cost of this kind of investment would be smaller for plants erected in the future, should the supply of plutonium outstrip the world's demand for energy. As to the installation proper and the operation costs, compared with those af a steam power plant (per kilowatt, and excluding fuel): add, roughly, the cost of health protection, but subtract the furnace and the loss of energy through the chimney. On this basis, atomic energy can probably compete with coal—even in this country of cheap coal—within the decade beginning with 1950; though it will hardly be used near the water power stations.

INTERNATIONAL CONTROL VS. MILITARY SUBSIDY

Political factors may accelerate this development. The Lilienthal report suggests that the "unsafe" plants will be distributed over the world on grounds of political balance rather than according to the cost of energy in various countries. In the case of an atomic armament race, too, countries will make plutonium and energy, regardless of energy need. For countries like ours, with abundant coal or water power this means in both cases subsidizing of atomic energy: citizens pay taxes to buy security. But under the Lilienthal-Baruch scheme the subsidy is smaller (by the value of plutonium exported) and the security is greater (especially for a nation concentrated in large cities) than under a system of atomic armament race.

THE FULL ECONOMIC EFFECT

Our economic estimates were based so far on saving the fuel transportation cost: between ⅛ of a per cent and 1 per cent of national income, depending on whether only stationary power production or also other uses of coal are considered. Should plutonium prove economically self-replenishing, and the installment and operation of the atomic power plants not too different in expense from a steam power plant, one might put zero as an optimistic limit for the atomic fuel cost. The nation's saving would then equal the cost of both mining and transporting coal (and possibly oil used in residential heating), i.e. roughly the double of the previously calculated amount: ¼% to 2% of national income, or weekends starting 5 to 50 minutes earlier than they do now.

This, however is, most probably, not an overestimate. A new invention does not merely displace labor and other resources. It makes possible new combinations. The locomotive and steamboat did not merely displace coachmen, horsebreeders, and sailmakers. Cheap freight rates combined with the cheap soil of new continents and the cheap labor of old have transformed the world. Fuel which involves virtually no freight cost will combine economically with cheap but remote natural resources, with the cargo plane, with the new alloys. Instead of shipping 4 tons of Surinam bauxite to this country to make 1 ton of aluminum, it may be worthwhile to make aluminum in Surinam using atomic power. Cheap aluminum may awaken new demand (for aluminum cars or trains, houses or kitchenware, both here and in China or India) to such an extent that existing American water power plants can continue to operate. Other distant mineral deposits, potential irrigation areas, airfields and harbors will be brought to life and new settlers will demand energy for their homes and trades. If coal freight cost is only ⅛ cent for each kilowatthour generated in this country, it is almost four times as high in the big cities of the South American Atlantic seaboard, and would be ten or twenty times as high in the inland mountains and deserts of that continent or of Asia.

Our own national economy will benefit from the opening up of new areas. They will pay, in cheap materials, for our exports of finished goods, machinery and some farm products, for the services of our capital and of American skilled workers and college graduates. This indirect benefit may quite likely exceed the 2% of national income which we had computed above as the (maximum) effect of replacing American coal by atomic fuel. Probably only the least efficient coal mines will be displaced by atomic power plants installed within our boundaries. Atomic power plants in new areas will create a new demand of those areas for our goods, in addition to the increased domestic and foreign demand for American goods made of cheap materials brought from those areas. Added demand for our goods means added demand for energy produced in this country. Atomic power can thus be introduced into our economy rather smoothly. To use most economically the uranium resources along with the coal and oil reserves, and with the water power of our country and the world, will require cautious comparison of the respective advantages. This will be a function of both the national and the international atomic development bodies.

The Pattern of an Armaments Race

An Anthropological Approach – Part 1 . . . *Gregory Bateson*

The view which an applied scientist—whether he be anthropologist or physicist—takes of the world is determined by two major premises: First that the phenomena with which he deals are so regular that certain forms of prediction are possible. This is a minimum statement of the determinism which is basic to all science, but it is not to be taken or mistaken for fatalism. The second premise in his creed, indeed, expressly rules out fatalism. It states that the deterministic prognosis in any given instance may be profoundly modified by the subject's awareness of the relevant circumstances and by his interpretation of these circumstances. Man is, within certain limits, capable of adaptive acts. That is to say, he is capable of modifying his behavior to deal with the circumstances as he perceives them from moment to moment—these modifications being related to the achievement of various types of goals or to the maintenance of physiological or social "steady states". We believe that more knowledge will give more scope for adaptive behavior and we discard that fatalistic fallacy which allows itself to be hypnotized into inaction by the very logic of its own analyses.

At the present time we may reasonably assume that every important nation has responsible planners—economists and psychologists as well as military men—at work on the problem of how to avoid being beaten in an atomic war, and therefore I shall not here attempt to duplicate their gloomy efforts but shall concentrate upon what can be done towards the elimination of war, with the **proviso** that, in fact, we need only consider those steps which do not prejudice the plans which aim at avoiding atomic defeat.

Broadly, there appear to be two sorts of relevant change towards which anthropologists might contribute suggestions based upon their particular types of analysis of the circumstances. These are: The retardation of the international armaments race and the diminution of nationalism.

ANALYSIS OF ARMAMENTS RACES.

Here we have to deal with a system of linked causes and effects, and this system is of a type which has been subjected to a great deal of analysis. (See, for example: Richardson, L. F. **Generalized Foreign Politics, (British Journal of Psychology Monograph)** 1939. Mead, M. et al. **Competition and Cooperation Among Primitive Peoples** McGraw Hill, 1937. Bateson, G. "Naven", Cambridge Univ. Press, 1936 Chapter XIII.) Broadly the phenomena may be summarized as regenerative (or "vicious") circles of cause and effect, such that A's actions become stimuli for B's actions of the same type, and these in turn become stimuli for further actions by A, and so on. Stated in these very broad terms, clearly every such system might progress at greater and greater speed until it topples over into the state of war. There are, however, a number of other considerations which have to be taken into account:

1. The relation between stimulus and action is complex and is subject to reversals of sign. In Richardson's basic equations it is assumed that A's rate of armament will be proportional to the amount of armament possessed by B. This basic equation he elaborates, examining also the implications of a system in which the effective stimulus would be, not B's total armament but that armament which B has in excess of A. The stimulus factor in the equation in then (B-A), and the rate of A's armament equals (B-A) multiplied by a constant which Richardson calls "the defence coefficient". Such an equation may satisfy those cases in which each side argues "The other side is getting ahead of us. We must therefore hurry up."

This, however, is not the only type of argument which stimulates armament. There is also an argument in which the sign is reversed. "The others are falling behind. Let's get ready to beat them up." In this case, and also in "The others are so far ahead of us that we had better appease them" we see a reversal of sign so that the stimulus factor which will make A arm more rapidly is now, not (B-A) but (A-B), and when this latter term is negative in value, we may even see "negative aggression" in the form of appeasement.

2. It is known that the various cultures of the world differ enormously in the degree to which they are characterized by predominance of one or other of these opposite types of relation between stimulus and aggressive activity. The "bully-coward" motivation is one which is rather sharply disapproved in American and English life, while motivation in terms of the excess of strength held by the opponent is strongly approved in terms of "fair play". In Germany, on the other hand, it is expected as a matter of course that the stronger will take advantage of his extra strength, and that the weaker will submit. In Russia, preliminary studies indicate that very high value is set upon achieving one's own full strength. It is not the fact that one can beat somebody else that is important but the assurance that one is exerting one's full strength. Conflict—especially conflict against an enemy who is conceived to be stronger than oneself—may help one to this assurance but conflict is by no means the only way of achieving it.

There is thus a vast field, here, for more exact research. It is of the first importance that the policy makers of the world and the journalists and peoples should have real knowledge and understanding of these diversities of motivation vis à vis strength. Only with such knowledge can they hope to retard the armaments race.

3. We must also consider the motivation which each side attributes to the other. Even though each side may be actually motivated in terms of the other's apparent extra strength and would actually slow down if they thought the others were weaker than they, each will attribute to the other the opposite type of motive. Each will say "If we don't catch up, the others will take advantage of our weakness and will say to themselves 'let's get ready to beat them up'."

4. All the statements in 1. and 2. above, require to be corrected for the fact that the stimulus term in the equations is not the real strength but the apparent strength—the strength of the others as it is perceived or imagined. This figure is subject to two main types of distortion: a. Increase or decrease due to the actual falsification of the reports and rumors which each arming nation will give to the outside world; and here again we shall encounter reversals of sign because any given nation will sometimes exaggerate and sometimes minimize the reports of its own strength which it gives to its own people and to the world. b. Increase or decrease due either to persecutional fears or to unrealistic optimism, and these psychological factors certainly depend upon the cultural conditioning of the individuals concerned, and upon their realistic sureness of their own personal strength. Such a recurrent myth as that of encirclement is no recent development in Germany but is a deepseated characteristic of German thinking. For example, in the German fictional films we find, instead of the "chase" so loved by Hollywood producers and American audiences, slow encirclements of the hero. The human imagination can not only exaggerate or minimize the strength of a potential

enemy, it can also distort the picture of how that strength would be used.

5. The matter is further complicated by peculiarities of the new weapons. The atomic bomb is not only a saturation weapon in the sense that when it is used the entire defence machinery of the attacked spot is dislocated. It is also saturating in the sense that a given nation need only possess a limited number—a few thousands perhaps—of this weapon to achieve "complete" aggressive strength. The making of further thousands will not further increase its aggressive power. And the same considerations apply, on the whole, to the vehicles by which the bombs are to be delivered. On the defence side, however, the picture is very different. Even adequacy of defensive preparation is probably impossible. Therefore it appears that we must expect a world in which several powers are saturated with the weapons of attack, but are still making frantic efforts to achieve some degree of efficiency in defence. The armaments race must then be staged, not as heretofore in expenditure of national effort upon weapons of aggression but in enormous expenditures upon de-centralization and interceptive defence.

What will be the psychological implications of this emphasis upon defence? An increasing fear of being attacked? An increasing belief that attack is the only defence? Or an increasing realization that war has become an intolerable business? And will every people react alike to this peculiar state of affairs? To these questions, the anthropologist can hazard an answer only to the last, and to this his answer will be "NO." It is most unlikely that the nations will react alike. There will be profound differences between them and these differences will be related *inter alia* to each people's special habit of response to contexts involving strength and weakness, attack and defence. Just how these differences will be expressed we cannot say without further research, but we can warn that the nations will certainly misinterpret each other's behavior and that it is unlikely that these misunderstandings will be of such a kind as to promote goodwill between them.

6. In addition to the factors which make for increased rate of armament among the nations, there is, as Richardson points out, one important factor which tends to diminish this rate, namely the expenditure which each nation must make to keep up the pace. His equations therefore contain a negative term in which the total strength of the arming nation is multiplied by a "fatigue and expense coefficient." Supposing these equations to be substantially correct at least for moderate disturbances —Richardson has analyzed a series of armaments races and demonstrated surprising regularity—we may then follow him in assuming that whether the system will move toward a steady state or toward infinite armament, will depend upon a rather simple relation between the constants involved. If we adopt the simpler form of the equations and consider the case of two nations, equilibrium will occur if the product of their "fatigue coefficients" is greater than the product of their "defence coefficients."

In terms of this analysis, the result of the atomic discoveries and other great advances in the machinery of destruction can be stated very simply. It has been to reduce the "fatigue coefficients." A nation can now become infinitely prepared to destroy its neighbors (though not prepared to defend itself) for the modest sum of less than five billion dollars. The likelihood that the system will reach equilibrium in Richardson's sense is therefore very much reduced, though it is conceivable that the nations, having achieved infinite aggressive armament might stand, glaring at each other for an indefinite period without actual war. But the fact that the techniques of rapid attack have so far outstripped those of defence make us doubt whether such a balanced position could be stable. In such a case, it would be too easy for any nation to succumb to the argument, "If we attack, the enemy will immediately become weak. Let us therefore beat them up," and too easy also, for each side to fear that the other may be on the point of arguing in this way.

SUGGESTIONS FOR RESEARCH AND ACTION

The foregoing, necessarily inadequate and schematic analysis of the mechanism of armaments races suggests lines of action which might be adopted and which would not prejudice those necessary plans which are designed to prevent any given nation from losing an atomic war:

1. Research. It is evident that full understanding of the phenomena can only be achieved by detailed studies of the specific psychology of the people and leaders of all the nations concerned. Further, it is evident that such knowledge when accumulated can only take effect if it is disseminated to the thinking and planning people all over the world. There must, at the same time, be sufficient dissemination at a more popular level so that the peoples may be a force which will push the planners toward realistic action. It is also very important that such increases in knowledge shall not merely reinforce the fatalistic fallacy, and this danger if clearly seen can be avoided.

2. Throughout the above analysis, that frame of mind which is stimulated to aggressive acts by the weakness of the other side appears as the joker. It is bad that nations should compete against each others' strength but infinitely worse that they should switch over to acting aggressively in response to another's weakness. The fear that our neighbours may do this is part of the mechanism of the armaments race, and will become of still greater importance when we reach an uneasy balance between several nations all possessing atomic arms. It therefore is essential that we determine as precisely as possible which nations are most likely to make this shift in motivation and the conditions under which the shift is most likely to occur. This is a matter about which realistic precautions may have to be taken but it is also one about which our own unrealistic fears must be kept in rigid control. Beyond this there are possibilities for strengthening the world climate of opinion which already condemns these aggressive acts which are motivated by the weakness of other peoples. And beyond this again, there are dim possibilities for the re-education of those peoples most prone to this type of motivation. Such a re-education would involve very profound shifts in institutional structure and slow modification of the patterns of family life —but without such changes the cultures which promote this type of motivation will continue to be doubly dangerous to the world—themselves likely to attack and continually stimulating other nations to fear that attack may occur.

(To be continued in the next issue.)

The UN Atomic Energy Commission. . .

In the July 1 and August 1 issues of the **Bulletin**, we reported the main stages of the proceedings of the UN Atomic Energy Commission during June and July:

(1) Presentation of the American and Russian plans by Baruch and Gromyko. This was followed by policy declarations by other member nations.

(2) Discussions before "Subcommittee No. 1," which dealt mainly with the Atomic Development Authority and its relation to the Security Council.

(3) Discussions before "Committee No. 2" which soon turned from the American plan to the Russian proposal of a convention outlawing atomic weapons.

CONTINUATION OF DEBATE ON GROMYKO PROPOSAL IN COMMITTEE NO. 2

In the **July 31** meeting, **General McNaughton (Canada)** stressed the difference between atomic bombs and earlier weapons, which make the outlawing of the former impractical without effective control. He pointed out that "in the case of the atomic weapon, the object of a country bent on aggression would be to destroy, by a surprise attack, the very capacity of another country to take retaliatory measures. The effect of the atomic bomb is so crippling that the danger of penalties would not prove a serious impediment to the use of this weapon."

"From Mr. Gromyko's remarks, if I have understood him rightly, he recognizes that the conclusion of the kind of Convention he has proposed must be accompanied by provisions of some safeguards. **I think it would be most helpful in the further discussion in the Committee if we could prevail on Mr. Gromyko at this stage to indicate what measures he has in mind.**"

General McNaughton's plea was supported by **Mr. Harry (Australia)**, who stated:

"The draft convention of Mr. Gromyko is clearly framed on the assumption that a mere solemn declaration by the contracting parties is insufficient—since national legislation to provide penalties for violators is also proposed. National legislation can, of course, be only of a very limited value in preventing international crimes against humanity by the use of a weapon which requires a nation-wide industrial effort for its manufacture.

"Mr. Gromyko has on several occasions referred to further measures to be adopted, additional to the Convention.

On 19th June, for example, he said:—

"The elaboration and conclusion of a convention of this kind should be followed by other measures aiming at the . . . establishment of a system of control over the observance of the convention and the taking of decisions regarding the sanctions to be applied against the unlawful use of atomic energy."

"It would be most useful if the Soviet delegate could, at this stage elaborate his proposals so that the Committee may have a clearer picture of their precise intention and implications."

"Mr. Gromyko has proposed further that all stocks of atomic energy weapons whether in a finished or unfinished condition should be destroyed.

"It can hardly be Mr. Gromyko's intention that the bombs should be destroyed by explosion. To do so would be to waste a precious and relatively scarce material which might be of tremendous value for the development of power, or for other uses beneficial to humanity. **Yet if, what may be referred to loosely as the "container" or "casing" of the bomb and the detonating mechanism are alone destroyed, the fissionable material which is the essential component would remain, and might, if it came into the hands of a potential aggressor, be used for the construction of atomic weapons within a relatively short period of time.**

"So even after destruction of existing stocks we would still be face to face with the fact that the peaceful and warlike applications of nuclear fission are closely interwoven . . . and that to ensure that bombs are not made we must ensure that fissionable material is not diverted to such manufacture.

"In the same way even the obligation not to produce atomic weapons would not affect the right of any nation to stockpile fissionable materials produced in the course of normal industrial processes. In the absence of a system of controls in which all nations could have complete reliance there would be a very powerful incentive to maintain such a stockpile for purposes of national defense.

For these reasons the Australian delegation is most anixous to hear from Mr. Gromyko:—

- **(a) The precise objectives which the Soviet delegation hopes to achieve through the draft convention;**
- **(b) The nature and purposes of the suggested national legislation;**
- **(c) What further measures of supervision and control he envisages?**

In answer to these requests, **Mr. Gromyko (USSR)** said that:

"No inspection as such can guarantee peace and security. The idea of inspection of atomic energy is greatly exaggerated in importance. It is a too superficial understanding of the problem of control."

Fundamental control, he asserted, was "by the co-operation of the United Nations." If it was deemed necessary to discuss in detail what action the Security Council would take under certain circumstances, this could be done, he said. He conceded that past treaties had been violated, but "now there was a new and more solid basis for international relations created through organization of the United Nations."

Dr. Nervo (Mexico) emphasized that measures to **prevent** violations are more important than **punitive** measures. **Mr. Parodi (France)** called for the Scientific and Technical Subcommittee to produce practical suggestions for control measures and asked for the postponement of political controversies until the report of this Subcommittee is forthcoming.

* * *

The **August 6** meeting was opened by a statement by the Chairman, **Capt. Alberto (Brazil)**, quoting the Presidential Committee Report on the results of the Bikini tests and its conclusions that "the use of atomic bomb can indeed destroy nations and change the present standards of civilization."

Mr. Hancock (USA) protested the assertion of Mr. Gromyko that the USA refuses to sign the convention outlawing atomic bombs unless the American control plan is accepted.

"We are anxious and willing to discuss and have been seeking to have views presented concerning any modifications or improvement in the controls which we advocate in our plan. In fact, we will be disappointed if this body cannot improve upon these proposals which were designed to insure the effective control for which our plan was developed."

I had hoped Mr. Gromyko would tell us what he had in mind when he referred to the Soviet proposal as contemplating that the UN, and the Security Council particularly "shall take international measures . . . action and if necessary international sanctions as regards violations of the convention." It might be useful to assume a situation in which, at some time in the near future, a nation might decide secretly to embark upon aggressive action, and as a part of that program to begin the secret production of atomic weapons. The queries which arise in our minds are 1) How the security council could learn of it; 2) What the Security Council would do if it learned of it; 3) What steps it could take to be sure that it had learned in time; and whether other nations would recognize any such steps

as the kind of safeguards referred to in our orders.

Dr. C. L. Hsia (China) called for patience and said, "In my humble opinion, **if it should take us a whole year to reach agreement on some of the basic issues of the control problem, we would have succeeded beyond all expectation.**"

Dr. Van Kleffens (Holland) said he understood the Soviet proposals to mean that the Security Council should be the organ of the United Nations in charge of control over atomic energy. **He wondered, how exactly, in the thinking of the Soviet delegation, the Security Council would carry out its preventive task.**

Mr. Gromyko (USSR): repeated that "the U. S. delegation says that it is ready to agree that atomic energy should be outlawed as a weapon, but only if we are prepared to accept the U. S. plan."

"Mr. Hancock says that it is the desire of the U. S. government to prevent the possibility, in the future, of any state preparing an act of aggression to make use of the atomic weapon, and with this in view, the U. S. government intends to provide for various measures to insure that such a thing shall not come to pass, and among other measures proposed is that of inspection.

"But at the same time **the United States seems to consider the present situation perfectly normal. A situation in which there is no agreement, no convention, no guarantees forbidding the production and use of atomic weapons. The U. S. seems to regard only the future as of the very greatest importance in this connection but at the same time regards the present situation as perfectly normal. But it is obvious that the present situation is abnormal . . . I don't see how one can ask other states blindly to believe in the good intentions of the United States and to accept the U. S. proposal as regards atomic weapons and at the same time to doubt the good intentions of others.** I do not see how we can at the same time envisage a control of atomic energy and refuse to sign an international convention preventing the production and use of atomic weapons.

"**Dr. Van Kleffens asks me, how,** according to the Soviet plan, the Security Council would carry out its function in enforcing the observance of the convention outlawing atomic weapons. The Charter gives the Security Council wide powers for the maintenance of international peace and security, going even as far as the application of sanctions. Sanctions are classed by the Charter in two categories, first, the rupture of diplomatic relations, the rupture of economic relations, a show of armed force, and second, the application of armed force. The Security Council therefore can take any necessary steps against an aggressor. That includes of course, action by the Security Council against an aggressor using or threatening to use atomic weapons. If it is found necessary to consider in more detail how the Security Council should carry out its functions as regards sanctions against a possible violator of the convention, we can discuss this question both here in Committee 2 and in the Atomic Energy Commission as a whole and we can make our recommendations accordingly.

I have already referred to the two principle lines on which enforcement should be insured. **First, the line of government action: the governments signing the convention would, by national legislation, take steps to insure that the convention is applied and would in particular provide for the most severe punishment. In the second place, the Security Council would guarantee the enforcement of the convention as a part of its duties in connection with the maintenance of international peace and security.**

Dr. Van Kleffens said he was disappointed by the very general nature of Mr. Gromyko's reply. He said that what he wanted to know was: How the Security Council would become aware of such a threat and how it would be able to act in time?

In reply **Mr. Gromyko** said that this question "arises also in connection with the action in general of the Security Council," and not solely in the case of the atomic control.

He declared two courses might be open to the Council: either the Council has in advance a definite system of measures to insure the observance of the convention, or it would need to develop individual methods to treat specific cases of infringement.

Sir Alexander Cadogan (United Kingdom) said that the discussion had turned around the question, whether the Security Council was to be the organ solely entrusted with atomic control. "I doubt whether before further enlightenment from the scientists an answer to this question can be given either way." He suggested that it might be better to wait until the Scientific and Technical Subcommittee had submitted its report.

Mr. Parodi (France) asked Mr. Gromyko what would happen in case a state was suspected of having violated the convention and this state was one of the five permanent members of the Security Council?

Mr. Gromyko in reply said, that he thought his previous speeches had given a clear answer to this question. "**A system of inspection as a means of control is not in conformity with the sovereignty of states.**"

As to the particular position of the permanent members of the Security Council, the Soviet proposal provided that the Security Council will act in accordance with the Charter "and this without the least (I wish to underline this, without the least) repercussions as to the rights and privileges of the permanent members or the prerogatives of the Security Council as a whole."

Mr. Hancock asked: How does any part of the United Nations learn of an unlawful act of a nation with atomic war in mind?

Mr. Gromyko replied that he could ask Mr. Hancock the question how the Security Council would know of proposed aggression, regardless of what weapon is going to be used?

After a brief discussion the Committee agreed unanimously not to hold another meeting until the Scientific and Technical Subcommittee had submitted its report.

* * *

The above statement of Gromyko, flatly rejecting the idea of international control and inspection, was perhaps the most disheartening statement heard in the Commission thus far.

SCIENTIFIC AND TECHNICAL SUBCOMMITTEE

The Scientific and Technical Subcommittee, for whose report the Committee No. 2 is waiting in order to resume its deliberations, is under the chairmanship of the distinguished Dutch physicist, Prof. H. A. Kramers. Profs. R. C. Tolman, J. R. Oppenheimer and R. F. Bacher acted as U. S. A. representatives, Prof. D. Skobeltsyn as representative of USSR, Prof. P. Auger represented France and Sir. G. P. Thomson Great Britain.

The Subcommittee met for the first time on July 19. Dr. R. C. Tolman said that the United States favored a resumption of all those methods of scientific interchange that were practiced before World War II: exchange of scientists, research workers, students, scientific cooperation between Academies of Science and other scientific bodies in the different countries, etc.

On the control of the exchange of information, Dr. Tolman made the following two points:

1. The exchange of information in all parts of the Atomic Energy Commission by the representatives of different nations will of course be subject to their national policies as to military security.
2. In cases where representatives on the Atomic Energy Commission need further information from the United States, in order to understand the

(Continued on page 16)

The US Plan for Control of Atomic Energy

. . . . *John Hancock*

I

The January 24 resolution of the General Assembly establishing the Atomic Energy Commission specifically directed the Commission, among other things, to make specific proposals "For control of atomic energy to the extent necessary to ensure its use only for peaceful purposes;" and "For effective safeguards by way of inspection and other means to protect complying States against the hazards of violations and evasions." The resolution did not direct merely the drafting of a treaty in which the nations would only exchange promises.

We have taken these instructions seriously. We know that the problem of the control of atomic energy is the most crucial problem of our time. It is indeed a matter of making a choice between the quick and the dead, between world order and world chaos. The problem cannot be solved by relying on pious hopes, sanctimonious declarations, or professions of international amity and good-will. They will not be enough. This must be a treaty to be kept—a treaty which the world will know is being kept or which the world will know promptly is not being kept so that the violators can be punished immediately.

The plan put forward by the United States is the product of many minds and of many months of realistic thinking. Mr. Baruch and his associates are the grateful heirs of the work that many groups and individuals have put into this problem—scientists, military men, men of industry, members of Congress, the press, the general public and various organized groups such as your own.

I know of no question before us today which is more demanding of the best thought of all of us. We must all think, think again, and rethink about the facts, about the implications that flow from the facts, and about the solutions. This, if ever, is the time for fully informed, painstaking, sound—yet imaginative—thinking. This is no time for torch bearers with uncompromising views on one segment of the problem. And in all this we will seek to understand, to synthesize, to bring together. We all have much to learn from each other, whatever our special field of interest. We must all strive to make our utterances responsible—rational and not emotional—certainly not such as stem from fears or incomplete consideration of the whole problem.

The United States plan, while it may startle those who seek the easy, the conventional, solution, is surely a realistic approach to the hard facts of the problem. It conforms not only to the facts and the needs of the situation but also to the mandate of the General Assembly which specifies a solution based on proposals for controls and effective safeguards.

In brief, the United States has proposed an international authority with unequivocal power to exercise full and effective control over atomic energy from birth to death and a system of swift and certain punishment for violations which shall be stigmatized as international crimes.

II

We do not expect—and we do not want—other nations to accept this plan merely because we are convinced it is a sound one. If any plan of control is to meet the needs of the world, the nations will accept it only if it serves their needs. We do feel, however, that, once the implications of the problem are fully appreciated by all nations which are earnestly and honestly seeking a sound solution, the means of handling this problem, finally arrived at, will necessarily follow the broad lines of the United States plan. So far as I know, every thorough student of the problem finally comes to the same basic conclusion.

We do not expect a quick solution. Even the most diligent and serious concentration on this matter, as has been fully in evidence in the deliberations of the Atomic Energy Commission, cannot evolve a ready answer. All nations must think this thing through—really come to grips with the facts—before they can arrive at a workable solution to which each nation will pledge its best endeavors. No matter how essential speed may be regarded, a sound plan, an effective control with adequate authority, is more essential. Nor is it enough simply to sign a treaty outlawing the bomb. We do not want a treaty covering atomic energy that will have the fate of the Kellogg-Briand pact—to mention only one. Further, it is not enough to set up a system of control such as is envisaged in the American proposal unless the nations will give it full support and subject themselves to an international inspection to prove they are doing so. In recommending an adequate system of control, including unhindered inspection which may be irritating and onerous, we fully recognize that the United States will, over a period of some years, be the primary country subjected to such inspection.

We must have patience and understanding. We must both teach and learn.

Some may say that our plan is too stiff, too novel—so demanding that it is doomed to rejection. Some go even so far as to say it was put forward in such form as to insure its rejection. To this I say it is no stiffer, no more novel, no more demanding than the facts of the problem itself. The United States wants an effective treaty that will command the support and respect of the world. That is our only objective. Anything less, in our judgment, would be a delusion of tragic proportions. Any less-than-effective plan for international control of this dread force would be worse than a simple declaration to outlaw the bomb, for it would arouse false hopes of security where no security exists.

III

The fundamental instinct of man is self-preservation. The fundamental concern of nations—their primary responsibility—is also self-preservation, and nations have sought it in the concept of absolute national sovereignty and national power. National power has given a measure of security but only up to the point of clash between what nations unilaterally consider to be their vital interests and aspirations. These clashes have come with increasing frequency, and when they occur they end only in war.

While in no sense a complete guaranty of self-preservation, reliance on national power is, at present, a nation's only final choice. It will not and cannot be relinquished until a more effective means of assuring self-preservation is found.

The advent of atomic energy has thrust upon the world the imperative necessity of finding a new means of assuring self-preservation. It also points a way that this may be done. It may be the catalyst that might hopefully bring about a new and fruitful relationship of nations and peoples. We think that the plan put forward by the United States meets the challenge by making full use of the positive, developmental aspects of atomic energy on an international basis. Atomic energy furnishes not only the challenge but also some of the means with which the challenge can be met.

The attitude adopted in developing the United States proposal was that it must be a fair-minded plan—fair to us and fair to all other nations. We would not propose it—and I am sure that the American people would not support it—if it were not. It is a plan of self-preservation, not for ourselves alone but for the entire world.

IV

But a plan, a treaty, indeed a system of control, is not enough. The Atomic Development Authority, however skillfully contrived, cannot work unless it is staffed with personnel of unquestioned integrity and competence. It cannot work unless it

The above is an address delivered before the Institute on World Control of Atomic Energy sponsored by the National Committee on Atomic Information, held on July 15 and 16 in Washington, D.C.

commands respect and confidence throughout the world. It must become an entity firmly implanted in the minds of men, an institution firmly accepted as an integral part of our world. This will take time. Its stature will grow only as it reveals by its actual performance integrity, impartiality, and competence. It must develop, if you will, an effective system of international administrative law built around positive executive functions. It must be something really new—a world agency with executive powers stemming from a treaty to which all nations have subscribed—something never before established.

By its positive, constructive operations it should attract men of professional competence, integrity, and good-will. By its example, the way may be open to a real community of nations founded on mutual confidence, and patterns of thought and action may be formed which might show the way to a successful tackling of the problem of war itself.

This is the vision that may one day come into reality. Is there anyone, anywhere in the world, who does not want this vision to come to pass?

But to come back to the present. We must not outpace ourselves. We must move step by step. We must proceed in the full knowledge that the vision might fade, that nations might prove unwilling to move toward world security at the price of a modicum of pride and position. We propose to conduct negotiations with this possibility in mind. The United States plan fully recognizes this possibility by providing for a step-by-step establishment of the Atomic Development Authority with requisite safeguards at every stage. These steps and these safeguards must be specifically defined in the treaty itself.

V

I should like now to comment briefly on certain misinterpretations that have arisen concerning the plan.

First—the question of the veto. Our proposal is this: once nations, by their own voluntary sovereign act, have become parties to a treaty establishing an Atomic Development Authority and spelling out its functions and setting up certain acts as international crimes, they must be unequivocally bound to abide by their undertakings. By this we mean bound on pain of severe, swift, and certain punishment for violations. No nation, having once signed the treaty, can suddenly repudiate it and expect to escape punishment for its acts of violation. It necessarily follows, therefore, that in this field alone—action cannot await a second act of unanimity, the first one having occurred when the treaty was signed. On the other hand, up to the point of accepting a treaty, every nation, including the United States, surrenders nothing, but if it violates its promise once freely given it must not be a judge of its own guilt, and no other nation may be allowed to prevent its punishment.

Within the general framework of the treaty, the ADA must have broad administrative powers. It will carry out policy. It will have to make important decisions and actively operate a large-scale program. It must act. It could not operate if it had to secure unanimous approval of its action from any other organization. The Authority must have power—unequivocal, effective power—commensurate with its responsibilities. What a futile thing it would be to assign such heavy responsibilities to such a body and provide it with less than enough authority to insure the carrying out of its orders.

Exactly how the problem of the unanimity rule of the Security Council can be met in this field, what the precise relationship of the ADA should be to the other organs of the United Nations, particularly to the Security Council, remains to be established. This problem is being given first consideration, and an acceptable solution **must** be found. The least that must be insisted upon is that (1) once violations of the treaty have occurred, punishment must be swift and certain, and (2) the operations of the ADA cannot be interfered with by the device of the unanimity rule. It would seem desirable, if possible, to accomplish effective control of atomic energy within the framework of the United Nations Charter; but no nation, and none of its nationals, can be permitted, by hiding behind the shield of any provision in the Charter, to claim immunity for wilful violations of a solemn agreement voluntarily entered into, or to prevent the effective operation of the Atomic Development Authority.

Second—the status of the United States plan. The plan put before the United Nations Atomic Energy Commission on June 14 by Mr. Baruch is the proposal of the United States. That is the only official plan. It has the approval of the President of the United States and the Secretary of State. Mr. Baruch is our government's representative in conducting negotiations based on this plan. It is perfectly clear, however, that any treaty that results from these negotiations must and will be subject to the approval of our Congress. And it must be a treaty, for neither the General Assembly nor the Security Council is so constituted as to bring into being such a plan. The United States cannot be bound by any treaty unless and until it is approved in accordance with our established constitutional processes. This is so obvious that I hesitate to mention it. I do so only because it has been implied by some people that we do not seem to recognize this fact. Such people either have not read the United States proposal or are deliberately attempting to mislead, for Mr. Baruch gave his personal word to a Senate committee on this specific point. Also, in presenting the United States plan on June 14th he explicitly stated: "Let me repeat, so as to avoid misunderstanding: My country is ready to make its full contribution toward the end we seek, **subject of course to our constitutional processes** and to an adequate system of control becoming fully effective, as we finally work it out."

Third—exchange of information. The situation on this point is clear. At the opening session of the Atomic Energy Commission Mr. Baruch said: "the United States is prepared to make available the information essential to a reasonable understanding of the proposals which it advocates." Only this and nothing more. The period of negotiation of the treaty is to be sharply distinguished from the series of stages in which the ADA will come into full possession of all information in this field **once the treaty is in full force and effect.** It is in this latter series of stages that we propose making more and more information available to the Authority in step with the progressive establishment of workable safeguards, proven in operation, to protect ourselves and the world from the misuse of such information by any nation. No nation can expect us not to be firm on this point. National security is not going to be impaired while we seek, but have no firm assurance of securing, an effective treaty.

An essential step in the series of stages, yet to be specified in detail in the treaty, would be the undertaking by the United States to dispose of its stock of bombs. This can come only when we and all other nations can be fully assured that no one can turn atomic energy to warlike uses.

VI

We seek security and peace, not for ourselves alone but for all men. We believe there is a way to get this and that that way is delineated in the U.S. proposal. We pledge our best efforts to attempt to secure its acceptance by other nations. With patience, understanding, and knowledge of the facts, we must hope that all nations will come to be convinced as we are convinced that this proposal in its general objectives offers "the last, best hope of earth". We refuse to consider now what we shall do if we fail.

A sound solution to this problem does not insure solutions to the many other problems that beset nations. Their solutions, too, require patience and understanding. But if we fail in this one most critical problem of our time other problems become mere details in a doomed world.

Bill Permits Use of Surplus Sales For International Exchange of Students

From a statement by Assistant Secretary of State Benton.

A step of great long-range significance for the advancement of international understanding was taken when the President signed an act of Congress, introduced by Senator Fulbright of Arkansas, which authorizes the Department of State to use some of the proceeds from surplus-property sales abroad for exchanges of students and other educational activities.

The bill provides that up to $20,000,000 can be earmarked for educational exchanges with any country which buys surplus property and up to $1,000,000 can be spent each year in each country where such an agreement is made. Thus tens of millions of dollars should become available under this bill, over a period of years.

The exchange of students and scholars is, in my judgment, the surest single method, over the decades, for promoting understanding among peoples. The activities of the press, radio, and films are indispensable in the exchange of current information among countries; but the effect of current development is often ephemeral, and news is often misunderstood for lack of background and context. The solid background acquired by those who study outside of their own countries can provide the basis for truer understanding of other peoples. The beneficent results of the Boxer Indemnity scholarships, in the relationship between the United States and China, provides one of the best examples of this.

The Department of State had already completed an agreement with Great Britain, pending congressional approval, which will provide $20,000,000 from the sale of surplus property for educational exchanges with the United Kingdom and the British colonies. Similar agreements are now being negotiated for amounts ranging from $3,000,000 to $20,000,000 in the following countries, among others: Australia, New Zealand, China, the Philippines, Burma, India, Iran, Iraq, Saudi Arabia, Turkey, Egypt, Greece, Italy, Austria, France, Holland, Belgium, and the Scandinavian countries.

The Fulbright bill authorizes the following types of educational activities:

(1) American students can be given grants of foreign currencies to be used to pay the cost of higher education or research in foreign countries.

(2) American professors can be given grants to give lectures in foreign institutions of higher learning.

(3) Foreign students can be given scholarships to study at American non-denominational institutions abroad such as the American University at Beirut, Syria, and Robert College at Istanbul, Turkey.

(4) Foreign students can be given funds to pay for their transportation to the United States to attend American institutions of higher learning.

It is implicit in the bill that all of these activities must be financed with foreign currencies. The bill therefore cannot authorize expenses of foreign students within the United States. The bill is designed to utilize foreign credits in many countries in lieu of American dollars for American surplus property.

The students who will benefit by this bill will be selected by a ten-man Board of Foreign Scholarships, which the bill authorizes the President to establish. The bill provides that this Board shall include representatives of the United States Office of Education, the United States Veterans Administration, state educational institutions, and privately endowed institutions. If funds are negotiated to the limit of the bill's potential, and if facilities abroad develop capable of handling the students, it is possible that 100,000 or more American students would be sent abroad under this bill in the next two or three decades.

Veterans of World War I and II will be given preference. The bill requires that "due consideration shall be given to applicants from all geographical areas of the United States." It is expected that some type of regional selection method will be devised to insure that all parts of the United States are suitably represented.

It is unlikely that any scholarships will be awarded under the authority of this act for the 1946-47 academic year. After the President has appointed the Scholarship Board, and the Board has determined the qualifications for awards, ample publicity and time should be permitted for all suitably qualified people to make application. It is hoped that the grants will be made in the spring of 1947 for the school year beginning in the autumn of 1947.

While the major effect of the Fulbright bill will be to permit thousands of American students to study abroad, we should be prepared to welcome thousands of foreign students to our shores.

The UN Atomic Energy Commission—Continued

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reasons for the provisions proposed for inclusion in the charter of an international authority, they should request such information from the United States representative, with a statement of the reasons why such further information is necessary for the purpose.

Mr. Gromyko stated that his proposals for the exchange of scientific information as put before the Atomic Energy Commission at its second meeting, were in no way in conflict with the views of the United States. "Nobody," said Mr. Gromyko, "is asking for secrets."

The subsequent meetings of the Subcommittee were held in private and only short bulletins were released to the press. On August 2 Dr. Kramers proposed that the Committee work towards a report in conformity with a request made by Committee 2 for information on the problem of control.

The projected outline for the report included such headings as:

1. A qualitative discussion, on a description of the problem;
2. The "order of magnitude", including the nature of the processes of making atomic energy, power, radiation and atomic energy as a military application—estimated within the limits of published information;
3. Analysis of the elements of "danger" —that is, dangerous as distinguished from safe use;
4. Legal processes—that is, authorized processes in any plan;
5. Illegal, or clandestine processes;
6. Operations not now known to be possible (that is, the possibility of new developments in the atomic energy field); and a summary and, if necessary, conclusions.

* * *

On August 7, it was suggested that this report be ready for submission to Committee No. 2 by 22 or 23 of August, but it has not been submitted by September 1.

From the little which has been released on the content of the Report, one cannot expect that it will offer solutions of the fundamental political difficulties encountered in the work of the Atomic Energy Commission. It will nevertheless be of importance if unanimity of all scientific experts—including those representing the USSR—can be achieved in, at least, the formulation of the technical requirements of a control system to ensure that atomic energy will not be used for military purposes.

PROF. AUGER ON U. S. CONTROL PLAN

I find myself in a rather difficult position having to tell you about how others look at you, because I do not exactly consider myself one of the others, having been in this country for a number of years including some of the most trying years of the war and having been fortunate enough to be able to collaborate in your atomic bomb project. So I shall try to speak more like a man speaking to one of his best friends and trying to tell him how the others are looking at him.

There is a reservoir of admiration everywhere in the world for the United States. You are looked upon, as the most powerful people, possessiong the most powerful scientific and technical achievements of the world.

There is perhaps not one other country which would have had in its possession such a powerful and unique weapon as the atomic bomb for a whole year without having used it either physically or as a means of political pressure, so that I may say that you are looked upon as a very peace-loving nation. Everyone knows how difficult it is for a nation like yours, a truly democratic nation, to go into war except as a defensive measure.

Further, you have presented a plan in which a very large amount of excellent thought has been crystallized. This plan provides us with a workable solution to the problems of atomic energy. One of the features of this plan is the renunciation, the final renunciation, of the use of atomic energy as a weapon, which is just now your big military weapon. So this plan is looked upon as an excellent price of statesmanship and as a really sincere contribution toward lasting peace. The plan is essentially generous, I think, but you don't see that immediately. It is a very serious attempt to get peace, peace for the United States and all the rest of the world.

But it would be excellent to add to that plan a gesture of sheer generosity. It might clear up the atmosphere, and further the United States plan. I would not dare to suggest the gesture that should be made, but it could be, for instance, to stop assembling atomic bombs, or to make available up-to-date scientific information, not classified information, but information of general interest to the scientists of the world.

Another thing is the distinction between the atomic weapons and others. The atomic bomb is a weapon, a more terrible weapon than the others because it kills more people in less time, but in spite of that it is a weapon just like the others. So that asking to outlaw the atomic weapon alone, and not to outlaw at the same time the mass bomb bombardments for instance has, in my opinion, no meaning at all.

POWER COSTS REPORTED TO UN COMMISSION

A report on the economics of atomic power plants, prepared by a scientific group under the supervision of Dr. Charles A. Thomas, vice president of Montsanto Chemical Company, has been presented to the UN atomic energy commission. A full account of the report will probably be published in the next issue of the Bulletin. *Below we give excerpts from newspaper accounts.*

A nuclear power plan with a capacity output of 75,000 kilowatts probably could be built and fully equipped for 25 million dollars in a normal locality in the eastern United States.

The normal operating cost at capacity would be approximately 0.8 cent per kilowatt hour as compared with a coal power plant which could be set up for 10 million dollars under the same conditions and operate at a cost of 0.65 cent per kilowatt hour.

Advantages of the nuclear plant as weighed against the cheaper production of power from coal under present conditions would include the output of by-product radioactive isotopes for use in analytical work and medical treatment.

The nuclear plant would yield certain advantages also over hydro-electric power plants in being able to supply heating and process steam directly in addition to producing power.

"The nuclear plant might aid in the industrial development of isolated parts of the world where the cost of oil, gas or coal is prohibitive and where a suitable supply of water is unavailable, because the nuclear power plant, if combined with the modern gas turbine, would make unnecessary a supply of any such fuels or cooling water."

"The operating temperature would be high enough to supply power, and...all the plutonium formed would be recovered for later consumption in the pile. No attempt would be made to produce plutonium for use elsewhere."

The present disadvantage of the nuclear power plant in comparison with coal power production would depend only upon the low price of coal.

"Equality of operating costs between coal power plants and nuclear power plants would be reached if the coal cost $10 per ton. It must be realized that lower costs of nuclear power plants can best be achieved by continued research and development.

"Nuclear power plants would make feasible a greater decentralization of industry, a desirable factor in the world economy. Only a trivial amount of fuel need be brought in, and the need for a large cooling water supply might be obviated by the development of gas turbines."

"It is the belief of many of the scientists and engineers connected with this work that a comparatively small standardized nuclear power plant will be developed. If this reasonable prediction comes to pass, such power plants can be placed at strategic points on all established utility company systems. They would greatly reduce power transmission costs and insure partial operation if the system were inoperative."

However, this "would of course complicate any inspection system."

WILLIAM L. LAURENCE ON THE BIKINI TESTS

(Continued from page 2)

casualties by intense neutron and gamma radiation as well as by blast and heat, whereas the under-water explosion could sink a battleship well over 500 feet away, an aircraft carrier more than 1,000 feet away and another battleship about 1,500 feet away. (The distances of the last two are conservative estimates based on personal observation. Foreign naval observers no doubt made more accurate estimates.)

We have, moreover, informed him that in addition to doing great damage to hulls, the under-water explosion threw about 10,000,000 tons of highly radioactive water on the decks and into the hulls of vessels so that "the contaminated ships became radioactive stoves" that "would have burned all living things aboard them with invisible and painless but deadly radiation."

With this information as a blueprint, an enemy would thus know how to use atomic bombs against a fleet in a harbor. He would know just how many bombs he would need and how to space them to destroy the harbor and the ships and all living things aboard them.

It must also be remembered that it is not likely that atomic bombs would be dropped from an airplane at high altitude or be surreptitiously planted below the surface. The development of the V-2 rocket makes it more probable that before long the long-range guided missile, hurtling at 5,000 miles an hour at altitudes of several miles, would be the choice method of dealing swift death to cities and populations.

These are the sober facts that the peoples and statesmen of the world must keep constantly in their minds. They must learn to heed the scientists' warning that no defense against the atomic bomb is possible other than the elimination of war and the effective international control of atomic weapons.

The Atomic Energy Act: An Analysis . . . . *Edward H. Levi*

The Atomic Energy Act of 1946 is now law. The scope of this legislation may be seen from the following propositions:

1. The disclosure of information relating to atomic energy having no military significance but of industrial importance may be a crime punishable by a fine of not more than $20,000 or imprisonment for not more than twenty years;

2. The Atomic Energy Commission may seize and take over, through condemnation proceedings, any real property containing deposits of uranium or thorium, and with the consent of the President it may seize and take over, through condemnation proceedings, any real property containing any other material determined by the Commission to be peculiarly essential to the production of fissionable materials;

3. After the Act has been in operation, a research worker may not gain access to data relating to the production or use of fissionable material until his character, associations and loyalty shall have been investigated by the Federal Bureau of Investigation and the Commission shall have determined that his access to the data will not endanger the common defense or security;

4. It may be a crime for any American company to have a foreign affiliate, as for example in England, engage in the production of fissionable material;

5. No military or industrial arrangement can permit the distribution of fissionable material to any foreign country unless there is a treaty to that effect approved by the Senate or an international agreement hereafter approved by the Congress;

6. A scientist of competence and an American citizen may be unable to procure fissionable materials for research work because the Commission believes that the distribution to him would be inimical to the common defense and security;

7. The Commission may determine whether a private patent shall be permitted covering the utilization of atomic energy for non-military purposes;

8. The use of atomic energy for non-military purposes, other than research or developmental work, is subject to the licensing authority of the Commission and any license given will be revocable by the Commission at any time;

9. No uranium removed from its place of deposit may be transferred to any person unless authorized by the Commission either through a license or a general ruling of the Commission.

10. Private possession of fissionable material and private operation of government facilities for the production of fissionable material in an amount adequate to produce an atomic bomb are within the discretion of the Commission.

* * *

These propositions do not serve to discredit the legislation which has been passed. They merely emphasize the difficult problems inherent in such legislation and the consequent broad discretion and power given to the Atomic Energy Commission. Few governmental appointments will be of more significance than those to the Commission.

The legislation establishes a five man civilian Atomic Energy Commission which will own all of the fissionable material in the United States and will control the transfer of all source material after it has been removed from its place of deposit. "Fissionable material" is defined to mean plutonium, enriched uranium, and "any other material which the Commisssion determines to be capable of releasing substantial quantities of energy through nuclear chain reaction of the material, or any material artificially enriched by any of the foregoing; but does not include source materials". "Source material" is defined to mean uranium, thorium "or any other material which is determined by the Commission, with the approval of the President, to be peculiarly essential to the production of fissionable materials." The control over fissionable and source material automatically gives to the Commission complete domination over atomic energy development in this country.

* * *

An obvious attempt was made by the framers of the legislation to achieve a delicate balance between the need for control and the desire to preserve a maximum amount of freedom for the scientists, commercial enterprise and the ordinary citizen. The legislation thus represents a series of compromises. And in most instances where freedom consistent with the necessary control was possible, that freedom has been preserved. Even so, the governmental powers which have been granted are extreme. This is the first legislation to reflect the enormous demands which domestic legislation will have to make in an atomic and divided world.

A compromise was achieved on the military-civilian issue. The members of the five-man civilian board, without special enabling legislation in the future, cannot be active members of the armed forces. They can be retired officers. For the military part of the compromise, a Military Liaison Committee has been created by the legislation. This will consist of representatives of the Departments of War and Navy, assigned by the Secretaries of War and Navy. The Liaison Committee will have consultative powers, but in addition, if the Committee concludes that any action or failure to act of the Atomic Energy Commission is adverse to the responsibilities of the War or Navy Departments, the matter is to be referred to the Secretary of War and Navy and if either concurs in the view of the Committee, the matter then goes to the President for his final decision. To this extent the legislation formalizes what undoubtedly would have been the case in any event, but in its formalization of accepted practice and legislation has undoubtedly given added prestige to the position of the army and navy liaison officers. For example, the consultation between the civilian Commission and the military Committee covers all atomic energy matters which the military Committee (not the civilian Commission) deems to relate to military applications. Additional position is given to the military in that the director of the Division of Military Application within the Commission and appointed by the Commmission must be a member of the armed forces.

* * *

A compromise was achieved on the problem of government ownership of materials useful in the development of atomic energy. Here the distinction between fissionable material, as matter capable of releasing substantial quantities of energy through nuclear chain reaction, and source material, as matter essential to the production of fissionable material, has served to cut down the automatic ownership given to the Commission. But while under the legislation, the Commission is not given automatic ownership of source material, and it is clear from the intent of the legislation that it is hoped that the Commission will not require such ownership, the power to achieve such ownership through condemnation proceedings has been explicitly granted.

The intent of the legislation appears to be to require the Commission to make fissionable material which it owns available for private research and developmental work. This may be done with or without charge and the Commission is directed "to distribute sufficient fissionable material to permit the conduct of widespread independent research and development activity, to the maximum extent practicable." The Commission is authorized to make "arrangements (including contracts, agreements, and loans) for the conduct of research and development activities". These arrangements are to contain provisions to "protect health, to minimize danger from explosions and other hazards to life or property, and to require the reporting and to permit the inspection of work per-

formed thereunder". It is explicitly provided, however, that the arrangement terms "shall not contain any provisions or conditions which prevent the dissemination of scientific or technical information, except to the extent such dissemination is prohibited by law". No such explicit limitation is placed upon the conditions which the Commission may exact as part of its rules or regulations governing the conduct of recipients of distributed fissionable material, although it should be urged that this is the intention of the legislation.

Beyond this it is to be noted that the Commission is ordered not to distribute fissionable material to any person "if, in the opinion of the Commission, the issuance of a license to such person.... would be inimical to the common defense and security", and no arrangement is to be made unless the person with whom such arrangement is made "agrees in writing not to permit any individual to have access to restricted data until the Federal Bureau of Investigation shall have made an investigation and report to the Commission on the character, associations, and loyalty of such individual and the Commission shall have determined that permitting such person to have access to restricted data will not endanger the common defense or security". These two provisions insure a great deal of control by the Commission over the personnel of research projects. And this control is somewhat increased by the absence from the final draft of any explicit provision authorizing grants-in-aid for research work, although it is to be strongly urged that the term "arrangements" in its context is broad enough to include grants-in-aid.

* * *

The control over the dissemination of atomic information is broad and the penalties and hazards for violation are extreme as established by the legislation. The legislation makes it a crime to communicate, transmit or disclose restricted date with intent to injure the United States or with intent to secure an advantage to any foreign nation. It makes it a crime to attempt to acquire restricted data with either such intent. "Restricted data" means "all data concerning the manufacture or utilization of atomic weapons, the production of fissionable, or the use of fissionable material in the production of power, but shall not include any data which the Commission from time to time determines may be published without adversely affecting the common defense and security".

If a broad meaning is given to the term "restricted data", and if the Commission does not act to authorize publication, any attempt to further world science through the exchange of non-military but industrially important information on atomic energy will constitute a crime. And it is conceivable also that the exchange of related medical information will constitute a crime, and not because the United States is injured but because a foreign country has been aided. These are obvious hazards and limitations on the freedom of scientific inquiry. Moreover the discretion of the Commission is limited by the assertion of Congressional policy in the Act that "until Congress declares by joint resolution that effective and enforceable international safeguards against the use of atomic energy for destructive purposes have been established, there shall be no exchange of information with other nations with respect to the use of atomic energy for industrial purposes". Domestic freedom is thus dependent upon international security.

On the other hand it appears that the legislation no longer authorizes the compartmentalization of restricted data within projects, even though the projects are conducted by arrangement with the Commission, in such a way as to deny information to persons determined by the Commission, after Bureau investigation, to be entitled to access to restricted data. Attention will have to be paid at all times, however, to "the applicable provisions of any other laws" which may place additional limitations on the exchange of information. Such limitations, however, will have to be in harmony with the broad purpose, as stated in the Atomic Energy Act, to permit and encourage the dissemination of scientific and technical information "so as to provide that free interchange of ideas and criticisms which is essential to scientific progress".

* * *

A compromise was achieved also as to the use of patents. Patents can no longer cover the production of fissionable material or the utilization of fissionable material or atomic energy for a military weapon. Patents are permitted where the coverage is the utilization of fissionable material or atomic energy for non-military purposes. Where such patents are granted, the Commission has the discretion to license the use of the invention. The compromise which was achieved therefore is similar to that worked out for the control of information except that where the dissemination of information is concerned, the use of fissionable material for the production of power is regarded as more clearly affected with the national interest.

* * *

When the Commission has been appointed, it will have certain immediate duties. It will have to establish regulations permitting the retention and providing for the distribution of fissionable materials. The possession or transfer of fissionable materials sixty days after the effective date of the Act will be unlawful without this permission. It will have to establish regulations and provide a procedure for the granting of licenses covering the transfer of source materials. In cooperation with the Federal Bureau of Investigation, the Commission will have to set up procedures for the certification of the loyalty of research workers. And no doubt the Commission will wish to at once take some steps towards the declassification of some restricted data within the limits set up by the Act. But there will be broader duties as well.

The Commission must organize itself for a program of federally conducted research and development work. It must either itself or through contractors using government equipment produce fissionable material. To insure a rapid and a healthy development of atomic energy in this country, it must make arrangements with private institutions for research and development work. It must begin a study of the industrial, commercial and other non-military uses of atomic energy so that it may make the necessary reports to the President and the Congress, as provided by the legislation, and so that it may be in a position to determine whether to issue licenses for this kind of manufacture or production which goes beyond the research or developmental stage.

In its work the Commission will be aided by a General Advisory Committee of nine part-time members appointed by the President. This advisory committee is part of the compromise which permitted the requirement that the Commission itself be composed of full-time members. The Commission also can be aided by advisory boards which it has the power to create. The Commission no doubt will work closely with a joint congressional committee on atomic energy brought into existence by the Act.

But in its administration of the compromises worked out in the legislation through which unprecedented power in a new field has been given to the government, the Commission must have the aid and constant criticism of non-governmental scientific groups. The Act represents a further experiment in governmentally controlled research. The limitations which have been placed on governmental powers will be more genuine if independent scientific groups remain active. Such aid and criticism will be even more important for that period when the hope expressed in the Act that "any provision of this Act or any action of the Commission to the extent that it conflicts with the provisions of any international arrangement made after the enactment of this Act shall be deemed to be of no further force or effect" remains unrealized.

Plans for Nuclear Research in U.S. . . .

The Argonne National Laboratory . . .

The successor of the Metallurgical Laboratory, one of the most important branches of the Manhattan Project, is the Argonne National Laboratory, so called after the Argonne Forest Preserve 30 miles west of Chicago, the location of one part of the Metallurgical Laboratory including the piles and accessory installations.

The Argonne National Laboratory has been established and is being supported by the Federal government. It is managed and operated by the University of Chicago as Contractor. Its administrative organs are a Council of Participating Institutions, a Board of Governors and the Director.

The Participating Institutions are twenty-five of the leading Universities and Research Institutes in the middle west. The charter members are:

Battelle Memorial Institute, Carnegie Institute of Technology, Case School of Applied Science, Illinois Institute of Technology, Indiana University, Iowa State College, Mayo Foundation, Michigan State College, Northwestern University, Notre Dame University, Ohio State University, Purdue University, St. Louis University, Washington University, Western Reserve University, University of Chicago, University of Cincinnati, University of Illinois, University of Iowa, University of Michigan, University of Minnesota, University of Missouri, University of Nebraska, University of Pittsburgh, University of Wisconsin.

Other institutions which, because of research interest, qualified personnel and geographical location, find it possible and to their advantage to take an active and constructive part in the cooperative program of the Laboratory may be considered as possible future Participating Institutions.

The Participating Institutions annually designate a Council of not more than 25 members. This Council elects a seven-man Board of Governors. The first Board of Governors consists of:

Prof. Farrington Daniels—University of Wisconsin (Chairman)

Dean O. W. Eshback—Northwestern University

Chancellor R. G. Gustavson—University of Nebraska

Chancellor A. H. Compton—Washington University

Prof. F. W. Loomis—University of Illinois

Dean J. T. Tate—University of Minnesota

Prof. F. H. Spedding—Iowa State College

The Director is Prof. Walter H. Zinn, formerly Director of the Argonne Laboratory under the Metallurgical Project. Drs. Norman Hilberry and Harvard L. Hull have been appointed Associate Directors.

The Director and the scientific staff of the Laboratory will have full responsibility for the formulation of the research program. When approved by the Board and the Government, the detailed implementation of the approved program will be the responsibility of the Director and the Contractor.

The scientific staff of the Laboratory will be made up of two classes (a) temporary staff members, and (b) regular staff members. Both classes will have the same opportunities for use of the Laboratory facilities in research upon approved programs, and both classes will be required to abide by the operating rules of the Laboratory.

Temporary staff membership is not limited to the staff members of the Participating Institutions. The Director may appoint any qualified scientist to temporary staff membership.

In order to achieve the objectives of the Laboratory, it is essential that it have in addition to its temporary staff, a regular staff fully qualified to initiate and carry out scientific investigations.

Current research and development programs will be continued and new programs in the field of atomic energy will be initiated, including the development and construction of new types of piles. It is intended that the research program emphasize the training of scientific personnel.

The programs at the Laboratory will include both fundamental research, largely unrestricted as to security regulations, and process or development research which may be of secret character. Emphasis will be placed on fundamental research requiring the use of piles or of other equipment of too great cost for a university or private research institution to underwrite, or involving health hazards requiring the special facilities and services of the Laboratory. As a general policy, major duplicating research programs will not be encouraged at the Laboratory if suitable personnel and facilities are actively engaged in such programs at an associated institution, although individual members of the staff may be concerned with such problems and will be expected to carry on some work in such fields.

In addition to the scientific work carried on by the regular staff of the Laboratory, investigations may be arranged on a cooperative basis with the scientific staffs of the Participating Institutions as represented by the Council, or with qualified scientific investigators from other institutions.

The research programs will emphasize work in nuclear physics and chemistry and in those phases of the physical, biological, and engineering sciences which are of interest to the Atomic Energy Project and will include such other investigations as the Director, the Board of Governors, and the Government may approve as appropriate due to peculiar requirements for use of special Laboratory facilities.

It is anticipated that all final results of the Laboratory may be published in detail in suitable government journals which may be classified or unclassified as the nature of the work and national security policy dictates. It is further anticipated that such unclassified government publication will be given wide distribution and that such classified government publication will be made available to other government laboratories and contractors working under its sponsorship in the same field.

Regardless of government publication, any regular or temporary member of the Laboratory will be at liberty to publish any unclassified results obtained at the Laboratory in any accepted scientific journal and in such form as such journal may require.

Security requirements at the Laboratory will be in accord with government policies in effect at the time. Membership on either the regular or temporary staff of the Laboratory will be subject to agreement to abide by existing security regulations.

Nuclear Research Center At Camp Upton, N.Y.

Nine leading educational institutions of the East have cooperated to form Associated Universities, Inc., which will operate, as contractor with the government, the new atomic research center at Camp Upton, Long Island.

The nine universities comprising the group are Columbia, Cornell, Harvard, Johns Hopkins, Massachusetts Institute of Technology, Pennsylvania, Princeton, Rochester, and Yale.

Dr. Philip M. Morse, professor of physics at Massachusetts Institute of Technology and war-time consultant on scientific projects to the Navy Department, has been named as Director of Scientific Research.

Design on machines, which will cost approximately $5,000,000, will start immediately. Research, according to Dr. Morse, will be underway by early spring.

Contemplated technical installations include a cyclotron of 500,000,000 volts, a synchrotron of comparable size, and a uranium pile capable of producing a great variety of radiation useful in physical and medical research. The construction will include laboratories devoted to biological, chemical, physical, medical, and engineering research. Ten or twelve buildings are planned on the tract of 3,700 acres turned over to the project. The community, technical and non-technical, will comprise about 1,000 persons. The technical personnel will include a permanent staff as well as scientists on leave from various universities. Seminars for the staff and graduate students from universities are planned in the summer.

The primary purpose of the project, according to Dr. Morse, will be one of pure research, looking toward the peace-time application of atomic energy in industrial and medical fields and towards the training of more experts in this new and important field.

"It should be emphasized," said Dr. Morse, "that the project is in no way limited to scientists of the nine universities named. Universities in general have a tradition of leadership in pure research. This project will enable and encourage the scientists of all universities, not only in the East but those from other sections of the country, to cooperate in pure research. The project is designed for the cooperation of scientists of the staffs of all universities, large and small. By this cooperation, faculty members and graduate students will have the opportunity to get training in the new techniques of nuclear research."

The Oak Ridge Institute of Nuclear Studies

A problem that is receiving much attention in scientific circles today concerns the best procedure for ensuring the continuance and further development of broad fundamental research in the field of nuclear studies.

While there are differences as to procedure, the consensus appears to be that the broad national interest can best be served through the establishment of research centers for nuclear studies in several parts of the country.

The position of Oak Ridge as a possible location for one of these centers appears to be unique, both because of the elaborate facilities already built and in operation there and because of the presence of a large and active research group in the Clinton Laboratories already effectively engaged in such research. In view of this situation, a group of southeastern universities is sponsoring a plan looking toward the establishment of an Oak Ridge Institute of Nuclear Studies, where research at the Ph.D. level and above would be carried out in the fields of physics, chemistry, biology, medicine, and engineering.

The early establishment of such a cooperative Institute at Oak Ridge will have a number of important advantages in terms of the national interest in the development of atomic energy. Among these may be cited the following:

(1) The development of the Institute around the already existing research and production facilities at Oak Ridge can be accomplished with a minimum of delay so that cooperative research with universities can go forward actively at an early date.

(2) The cooperative Institute at Oak Ridge will serve as a prototype for the establishment of similar centers in other parts of the country. In the interim before the establishment of such other centers, research workers from universities in various parts of the country can be initiating research programs relating to nuclear studies, which otherwise would have to be delayed from one to three years.

(3) Two large isotope separation plants are being operated at Oak Ridge for the large-scale production of U 235 in addition to the research program being conducted at the Clinton Laboratories. Although these units are primarily industrial, the proximity of the large and active research group at the proposed Institute will be of great value in ensuring the vigorous development of these methods and in attracting and holding competent technical personnel for them.

(4) The location of a nuclear research center in the southeastern region is clearly important to the national interest. The recruiting of potential man power for work in this field has in the past been neglected except in limited regions of the country, notably the Northeast and the far West. With the location of a large and progressive research establishment in the Southeast, young men who otherwise would not be attracted to scientific work of this type will become interested.

(5) It is apparent that such research centers, wherever they are located, will have to be organized as geographically independent entities, and it will not, in general, be possible to locate them in close proximity to already existing educational or governmental institutions. The availability of an adequate amount of Government-owned land and the Government's existing large investment in facilities at Oak Ridge point toward this as one of the logical locations for the establishment of such a research center. In order to implement the establishment of such a cooperative Institute effectively, it will be necessary only to group and allocate properly such expanded research facilities as are contemplated at Oak Ridge in a common area where they can serve as the nucleus for the development of a future Institute. It is hoped that planning for the extension of research facilities at Oak Ridge will be done in such a way that these facilities can be brought together in a common area which would be appropriate for the future development of an Institute.

The national stake in the future of atomic energy is a vital one, and any steps that will assure that active research is not interrupted are of the utmost importance at this time. The effectiveness of such research depends on continued cooperation between private agencies, such as the universities and industry, and the Government. It therefore seems imperative that advantage be taken of the opportunity existing at Oak Ridge, with its established facilities and personnel, to develop immediately such cooperative research through the organization of an Institute for advanced nuclear studies.

MEMBERS OF THE EXECUTIVE COMMITTEE

W. G. Pollard, University of Tennessee, *Chairman*; P. W. McDaniel, Manhattan Engineer District, *Secretary-Treasurer*; J. P. Ferris, Tennessee Valley Authority; P. M. Gross, Duke University; D. E. Hull, Carbide & Carbon Chemicals Corporation; H. L. Hull, Tennessee Eastman Corporation; F. G. Slack, Vanderbilt University; and E. O. Wollan, The Clinton Laboratories, Monsanto Chemical Company.

Debate on World Government or Discussion of Atomic Energy Control . . . . *William T. R. Fox*

The Lilienthal report of March 16 and the Baruch proposals of June 14 have succeeded in evoking support from an extraordinarily broad spectrum of American opinion. Opponents and proponents of world government even ceased belaboring each other at least for the time it took them to proclaim their support of these proposals as embodying satisfactory minimum short-run goals. Is it possible that the great debate on world government has generated more heat than it should have and less light than it might have? It is difficult to explain their agreement with each other on this crucial question of public policy unless the earlier disagreements were more apparent than real.

We have Chancellor Hutchins's word for it that he knows of nobody who believes we can have world government this afternoon. He would have been equally hard put to find anybody who does not ardently wish for an end to the threat of atomic war by the abolition of the multiple-sovereignty system which has bred a dozen general wars in three hundred years. Yet much of the public discussion has been carried as if the one group naively believed that a miracle would cause the men of all nations suddenly to demand world government and as if the other really wanted atomic warfare and liked the multi-state system.

RECONCILIATION ACCOMPLISHED BY THE US PROPOSAL

How is it that those who said that nothing less than world government would prevent atomic war and those who said that it would be necessary to reconcile one's self to a great deal less have united in supporting the Baruch proposals? Both groups had taken as a major though generally unstated premise that it would not be possible to have just a segment of world government. Both believed that an efficient inspection process would have involved an international inspectorate in intervention in the daily activities of national governments and individual citizens at a myriad of points. Both believed that effective inspection would have been possible only if the world atomic energy control authority were able to intervene at will throughout the whole range of human activity.

To the world government advocates this meant that mankind had to make quickly a gigantic leap to create a world authority powerful enough to impose its will on even the greatest of existing states. To those who believed world government not possible in the near future and concluded that a solution had to be found within the framework of the existing multi-state system, this meant that national security and world freedom from atomic war could not be based solely on faith in a possibly inefficient inspecting process.

THE VIRTUES OF THE LILIENTHAL INSPECTION SCHEME

By pointing the way to a method of inspection that was both simpler and more efficient than had previously been thought possible, the Lilienthal Board of Consultants were able to satisfy the critics of world government on one count. A system that promises that, so long as no clear warning to the contrary has been given, there is no illicit production of atomic weapons or fissionable materials anywhere in the world permits a responsible statesman to agree to his own state's total atomic disarmament. A system which permits the underlying strategic balance to reassert itself in the event of a violation or breakdown of the atomic energy control agreements provides a solution within the framework of the multi-state system.

By giving to the world authority a monopoly in all "dangerous" activities in the atomic energy field and by permitting the redrawing whenever necessary of the line between safe and dangerous activities so that the control mechanism can be modified in the light of technological advances, the proposals permit that indefinite expansion of the authority's scope which the world government group has believed necessary. The direction of the expansion, however, is toward the end-point of a perfect monopoly by the world authority of all activities related to atomic energy. It is not toward that unrestricted expansion of the authority through every field of human activity which few statesmen would today agree in advance to permit.

It is precisely because the probable necessary expansion of the authority's field of action seems so modest that the one group believes that the proposals meet its minimum requirements and the other believes that they stay within the limits of what can now be agreed upon. Both groups have given up the belief that total world government is necessary to efficient inspection. Their reconciliation has thus become possible.

SANCTIONS AND THE EFFICIENCY OF INSPECTION

In this redefinition of positions other differences between thoughtful students of the problems of atomic energy control seem to diminish. An inspectorate which might not discover until very late in the day large-scale violations of atomic energy control agreements would have to be supplemented by a machinery of punitive sanctions kept continuously ready. This would have meant either national governments or an international authority kept in a state of total atomic preparedness. With an efficient inspection process, which promises a period of grace between the sounding of the danger signal and beginning of atomic blitzkrieg, the debate over the organization of sanctions could be postponed until the violator had revealed himself and co-operation among the non-violators could be spontaneously developed. This would be true if proper precautions were taken to maintain an underlying strategic balance such that the world community would not be defenseless against a new disturber of the peace.

Even if nothing more were provided for during the period of grace than that "all bets are off" and all nations free to push vigorously their respective atomic armaments program and to co-operate in punitive action against the atomic aggressor, advocates of world government and skeptics could join in expecting spontaneous co-operation. They can also join in recommendations on the course to be followed during the period of grace. So long as this period is assured and reasonably prolonged, they can agree upon the desirability of organizing in advance an instantaneously operative machinery of sanctions which would operate without the use of atomic weapons to crush the aggressor before he could make decisive use of his illegal atomic weapons. They could therefore further agree that, until the clear and unmistakable danger signal had been given, there should be no legal atomic weapons in existence anywhere, except possibly those few necessary for the international authority to keep its research program well ahead of that of any violator. There should be little difficulty in agreeing on that "immediate and condign" system of penalties which Mr. Baruch has declared would have to be invoked against a violator.

THE CONSEQUENCES OF A YEAR OF CENSORSHIP

There is still another point upon which consideration of the Lilienthal report can promote consensus. Much of the unnecessary disagreement between participants in the world government controversy might have been avoided if a more enlightened policy of declassifying secret material had been followed. Certain elements of the Lilienthal proposals were foreshadowed in the Report of June 11, 1945 made to the Secretary of War by seven atomic scientists who constituted the non-official "Committee on Social and Political Implications."* In particular, their references to the possibility of "compulsory denaturation" of fissionable materials to be made available for peacetime power use and to the possibility of "exact book-keeping" which would assure early detection of any misappropriated fissionable materials suggest that this report strongly influenced the Lilienthal group. This committee thus suggested two of the most striking features of the Lilienthal report even before the first experimental bomb was exploded in New Mexico. It did not, it is true, consider the problem of preserving some strategic balance among states in order to have an organized system of deterrents available in case a great state violated its agreement, nor does it refer to the necessity for creating an international authority with positive functions, which is the great and original contribution of the Board of Consultants. These, however, are elements of the Lilienthal-Baruch proposals which might have been developed in the early weeks of the debate had the report of June 11 been made promptly available or had barriers to communication been reduced between scientist and non-scientist, and between scientist and scientist. So much intellectual energy has been spent trying to pierce the fog of censorship that that available for working toward a reasoned consensus has been greatly and unnecessarily reduced.

SOME QUESTIONS STILL UNANSWERED

What issues then remain? The Lilienthal report and subsequent developments in American policy have not achieved a perfect harmony among hitherto dissident groups. They should, however, focus discussion on gaps in the Baruch proposals and on critical points of doubt and disagreement which remain. For example, it is not at all clear how agreement can be negotiated on a geographic dispersion of "dangerous" activities to be carried on by the International Atomic Development Authority. Extremely difficult and technical problems of ratios of production, of location of production facilities and power plants, or relative rates of development and exploitation of raw material resources have hardly yet been discussed. Nor has there been searching analysis of the difficulties of recruiting personnel for an international authority in such a way that the creative impulses of the scietific personnel will not be stifled by an incomplete disaffiliation from previous national loyalties.

Some questions which seem to require further discussion follow:

(1) **To what extent must any plan for atomic energy control be negotiated as a whole?** Are there any preliminary steps to which the United States might first agree, such as the outlawry of atomic weapons? In a stage-by-stage plan would it be feasible to negotiate and implement the first stage before negotiating the second stage?

(2) **To what extent must a complete control plan be implemented immediately?** The Lilienthal-Baruch proposals call for stage-by-stage implementation, presumably over a period of years, with a nicely calculated balance of benefit and sacrifice at each stage and a line of retreat left open, through maintenance of the underlying balance, at all stages in case of violation or breakdown. The Baruch proposals' efficacy depends, however, on the inspectorate having to inspect only for forbidden activities. The longer the period before the full plan is in operation the greater the problem of assuring each participant that no other participant had produced and secreted stockpiles of forbidden materials. If implementation were long delayed, the inspectorate would have to search not only for illicit activity but forbidden materials, and the inspecting process would again become complex and of dubious efficacy.

(3) **Is it feasible to negotiate a plan for atomic energy control apart from a plan for punitive sanctions?** The answer to this question, as has been indicated earlier in this article, depends on calculations regarding the probable efficiency of the inspecting process and the duration of the period of grace. On the answer to this question depends a judgment on the role of the veto in the present UN negotiations.

(4) **It is wise to attempt the control of atomic weapons apart from the control of other instruments of mass destruction?** Would successful negotiation and operation of an atomic energy control agreement give the participating governments confidence to proceed to control agreements for other possibly equally menacing weapons? Would separate negotiation of atomic energy control leave the nation which gives up it atomic armaments defenseless against the first nation whose scientists developed say a DDT for human beings?

(5) **Is there any line between "safe" and "dangerous" activities short of the line between activities related to atomic energy and all other activities?** If a great-power veto could be interposed to prevent a shift of the line in the light of technical advances, it might be better to begin by giving the world atomic development authority a complete monopoly.

(6) **To what extent is it necessary to restrict the development of atomic energy for peacetime power purposes in order to assure safety or to maintain the underlying strategic balance?** If the power use for atomic energy were to be given up, the simple way to maintain a strategic balance would be to prohibit all except miniscule atomic energy production installations. These would take care of medical and research requirements. If the peacetime power possibilities are to be developed, the political and economic criteria of the feasibility of specific power installations need examination.

(7) **Must there be a formal and explicit yielding of the veto if atomic energy control is to be achieved?** This appears at present to be the key question, but the answer to it depends upon the answer to other questions listed above. If enforcement is separable from control, if an unobstructed right of inspection is assured, if the redrawing of the line between safe and dangerous activities is not subject to veto, perhaps the gap between the Soviet and American positions can be closed and genuine agreement achieved.

STAFF REORGANIZATION IN THE NATIONAL COMMITTEE ON ATOMIC INFORMATION

The Executive Committee of the National Committee on Atomic Information has announced the following changes in and additions to its national staff:

Mr. Daniel Melcher resigned as Director on July 29.

Dr. Helen Dwight Reid, Vice-Chairman of NCAI, and director of the international relations activities of the American Association of University Women, is serving for a few weeks as Acting Director.

Mr. Livingston Hartley, noted writer on foreign affairs who served in the Navy during the war, will be Editorial Director, editing all NCAI publications, including Atomic Information, the NCAI Periodical.

Mr. A. E. Casgrain formerly the Chief of Group Liaison for UNRRA will serve as consultant on the relations of NCAI with member and cooperating organizations.

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* See Bulletin v. 1 No. 10.

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"OUR ATOMIC WORLD" PUBLISHED

The pamphlet "Our Atomic World," written by Profs. R. E. Marschak, E. C. Nelson and L. I. Schiff, all members of the Los Alamos Atomic Bomb Project, and published by the University of New Mexico Press, is now available.

The pamphlet contains a foreword by Prof. E. Fermi. The chapter on "Atomic Bomb Damage—Japan and USA" appeared in the **Bulletin** v. 1, No. 10.

"Our Atomic World" will be on sale at news stands. Copies may be obtained from the National Committee on Atomic Information, 1749 L St. N.W. Washington, D.C., or from the University of New Mexico Press, Albuquerque, N.M. The price is 50c.

FEDERATION OF AMERICAN SCIENTISTS

The Federation of American Scientists has announced the results of the election of the incoming Administrative Committee. The seven members are: Albert E. Cahn, David Hawkins, William A. Higinbotham, Philip Morrison, Melba Phillips, Joseph H. Rush, Robert R. Wilson.

The officers of the Federation will be elected at the next meeting of the Council to be held in New York City on Sept. 22 and 23.

The present issue constitutes a double number—Volume 2, Nos. 5 and 6. The price of a single copy of this issue is 20c.

The opinions expressed in the editorials and other articles printed in the Bulletin do not necessarily represent the official views of any organization.

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